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IN THIS ISSUE

Etiology and Preventive Measures in the Dark Cutter Syndrome
Bovine Encephalo-Meningitis
Use of Intramedullary Shuttle Pins in Cats
Feline Ovario-Hysterectomy
Infertility in Cattle
Infectious Bovine Rhinotracheitis

Complete Index on Page VI

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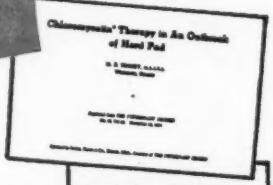

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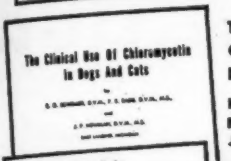

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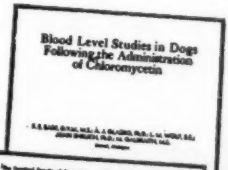

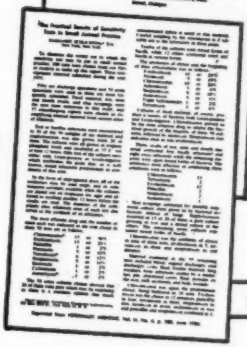

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by R. W. Barnes, D.V.M.

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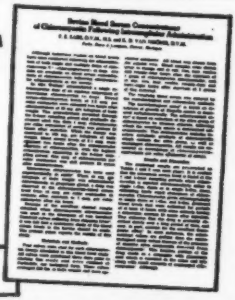

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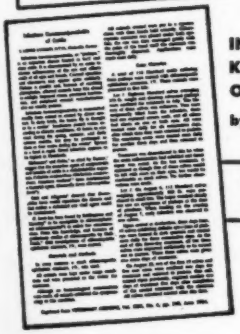

INFECTIOUS KERATOCONJUNCTIVITIS OF CATTLE

by S. Lester Jackson, D.V.M.

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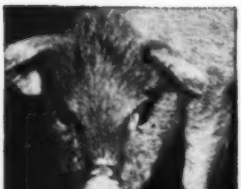

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Robert L. Anderes, D.V.M.—1902-1958... 463

General Practice

Etiology and Possible Preventive Measures in the Dark Cutter Syndrome 466

HAROLD B. HEDRICK, Ph.D.

Dark-cutting beef occasioned by cattle being subjected to stress prior to slaughter can be prevented with several measures. All are designed to mitigate stress factors.

Chlorpromazine Hydrochloride, An Aid to Collection of Semen by Electroejaculation 473

JOHN B. HERRICK, B.S., D.V.M., M.S.

Chlorpromazine hydrochloride administered intramuscularly or intravenously facilitates examination of the penis in bulls. Appropriate doses give tranquilizing effects, yet allow penile erection and ejaculation to occur.

Bovine Encephalo-Meningitis Associated with Erysipelas Infection 475

A. E. WHALEY, D.V.M., V. B. ROBINSON, D.V.M., J. W. NEWBERNE, D.V.M., M.S., and WILLIAM L. SIPPLE, V.M.D., Ph.D.

Reported here is a case of bovine encephalo-meningitis apparently due to Erysipelothrix rhusiopathiae. *Definitive diagnosis on two similar cases was unavailable.*

Keratoconjunctivitis in Turkeys 477

BERT W. BIERER, D.V.M.

Keratoconjunctivitis in turkey breeding flocks during cold months has presented a continuing problem to turkey growers. Vitamin A deficiency has been investigated. Efforts to reproduce the disease by artificial means have been largely unsuccessful.

Infectious Bovine Rhinotracheitis (IBR) . . 503

VICTOR J. CABASSO, Sc.D. and ROSS G. BROWN, D.V.M.

A live IBR virus preparation assayed for pathogenicity in calves in the undiluted form and titrated intramuscularly in the same species for immunogenic extinction revealed that the virus employed met criteria of an acceptable live virus vaccine.

Infertility in Cattle 507

A. M. MILLS, D.V.M.

Four common causes of bovine infertility to be investigated, when this condition is presented as a herd problem, are discussed by the writer.

Small Animal Practice

Use of Intramedullary Shuttle Pins in Cats 487

RUSSELL N. ABBOTT, D.V.M.

Large long bones of cats can be repaired satisfactorily with the use of Leighton Shuttle Pins.

Feline Ovario-Hysterectomy 490

ALLEN WOLFF, B.S., D.V.M.

Ovario-hysterectomy in the feline, using the flank approach, is described.

DDVP — A New Insecticide 492

MARTIN G. LORBER, D.V.M.

DDVP is a new insecticide for control of ectoparasites of animals. It is effective, rapid, and economical.

Feline Infectious Anemia 494

ROBERT M. SCHWARTZMAN, V.M.D. and EVERETT D. BESCH, D.V.M.

Re-evaluation of feline infectious anemia points up the need for additional information as to reservoir, mode of transmission, portal of entry and escape and determination of carrier state.

Editorial Comment

When You and the Income Tax Collector Do Not Agree 485

Chlorophyllin in Wound Therapy . . . 472

Antibiotics in Milk for Cheese 474

Grub Control 476

Iron-Dextran in Pig Anemia 476

Pasteurellosis in Man Now Recognized More Frequently 483

Florida Cattle Losses 486

Feral Nutria a Pest Problem 489

Tissue Repair 489

Cesarean Section 501

Agriculture and the Mark of Subsidy . 509

Nitrate Abortion 510

Veterinarians and Feed Men 510

Cell Growth in Artificial Media 511

Feed Additives Information 512

Specific Gravity of Blood and Plasma . 513

Reader's Service XXXII

Veterinary Calendar XLIX

Deaths of Veterinarians LI

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Salo Jonas, Dr. Sc. Nat., D.V.M. and Albert M. Jonas, D.V.M.

Repair of difficult epiphyseal fractures of both femurs and a fractured tibia with Jonas splints is described. The writers also present a new approach to the problem of correcting a 90 degree inward rotation resulting from subsequent fracture of the left femur.

THE DRUG STORE ANIMAL HEALTH DEPARTMENT

John H. Collins, D.V.M.

A point by point explanation of the Food and Drug Administration viewpoint on drug store traffic in veterinary products. Legal as well as ethical aspects are covered.

SQUAMOUS CELL CARCINOMA OF THE EYE OF A HORSE

Emmett L. McCune, D.V.M.

Diagnosis of carcinoma in the horse depends chiefly on careful selection of biopsy material for laboratory examination. Points on collection of material and possible therapy are noted in this case report.

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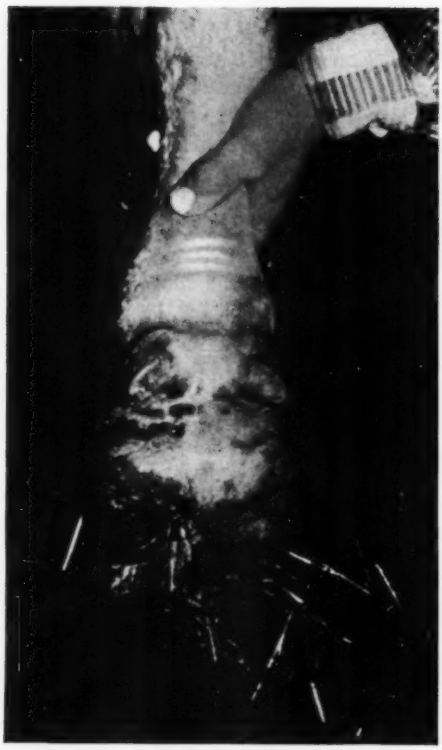

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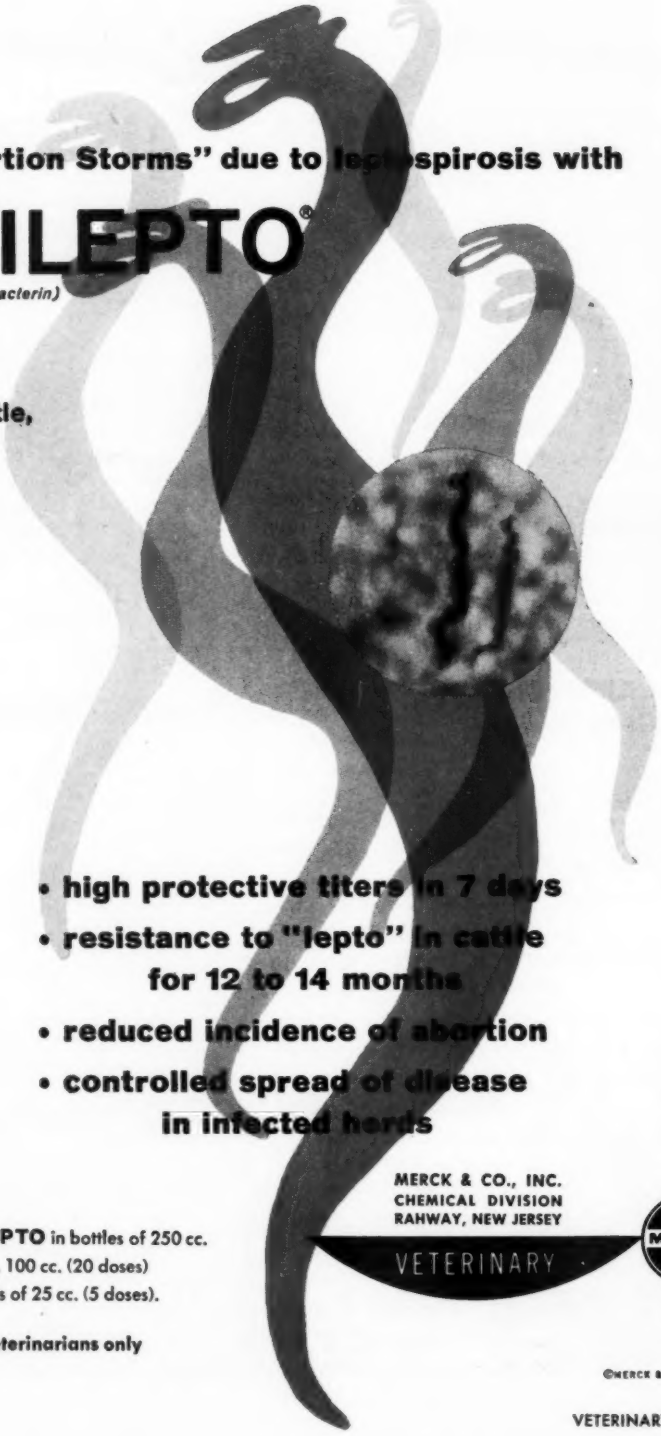

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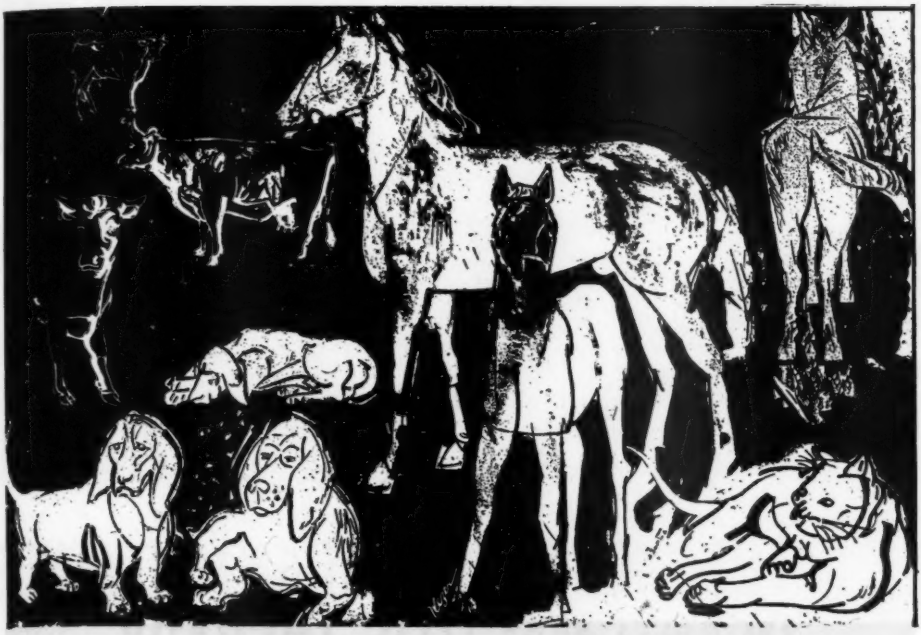

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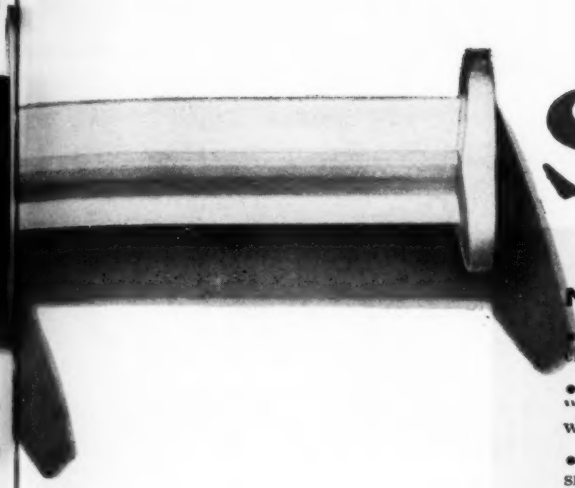

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News Comment

Research Target

Long term research on immunization of cattle against lungworm infection has been pursued by parasitologists and other technological personnel at the School of Veterinary Medicine, Glasgow, Scotland. At this early stage results appear promising.

Hog Cholera

Even though the market price of swine continues at favorable levels, a "let down" in total number of Midwest swine vaccinated for hog cholera is a matter of concern for practitioners and livestock sanitary authorities. It has been proved by field experience that when less than 50% of susceptible swine in an area are left unvaccinated, hazards of costly outbreaks of hog cholera are materially increased.

Large Animal Practice

The 17 veterinary schools that serve the American profession are graduating approximately 1,000 veterinarians annually. Of these about 65% enter practice. Approximately 54% of all those who enter private practice will concern themselves only with small animal medicine. This leaves only about 300 new recruits to replace the established large animal practitioners who die or retire in the 49 states. A shortage of livestock practitioners within the next decade is no idle dream.

Mammary Tumors in Dogs

The Sloan-Kettering Institute for Cancer Research, New York City, has announced that a program will be undertaken for the study and treatment of mammary tumors in dogs. In the announcement, it is explained that there is increasing evidence of striking similarities in the etiology, progress, and therapeutic responsiveness between canine and human mammary cancer. Hope is expressed that intensive study of the disease in dogs will lead to improved methods of treating breast cancer in both human beings and dogs.

Sloan-Kettering has solicited assistance of veterinarians in the New York area in the project.

Meat Consumption

"The amount of meat a nation eats is a more down to earth measure of its standard of living than the sweep of the fin on its automobiles. Americans are meat eaters. Last year they ate about 32,000,000,000 lbs. of beef, veal, lamb, pork, and poultry—190 lbs. of meat for each person. Few countries of the world can match this." Dr. M. R. Clarkson, Deputy Administrator, Agricultural Research Service, USDA.

World Record Sow

A feature article in the Missouri Ruralist has to do with a pure bred Landrace sow owned by Mr. Jesse Sick, Bethany, Mo., that weaned 20 of a 21 pig litter having a weight of 71 lbs. at birth. When 56 days of age the litter weighed 1,222 lbs. This owner who exemplifies modern master swine husbandry has averaged 10.9 pigs per litter since 1955.

Dye for Mastitis Ointments

USDA researchers may soon make available a new fluorescent dye or marker for detection of antibiotics in market milk. As an ingredient of intramammary mastitis ointments the dye will color milk from the quarters of treated cows for 48 hours and can be detected by ultraviolet light for 96 hours.

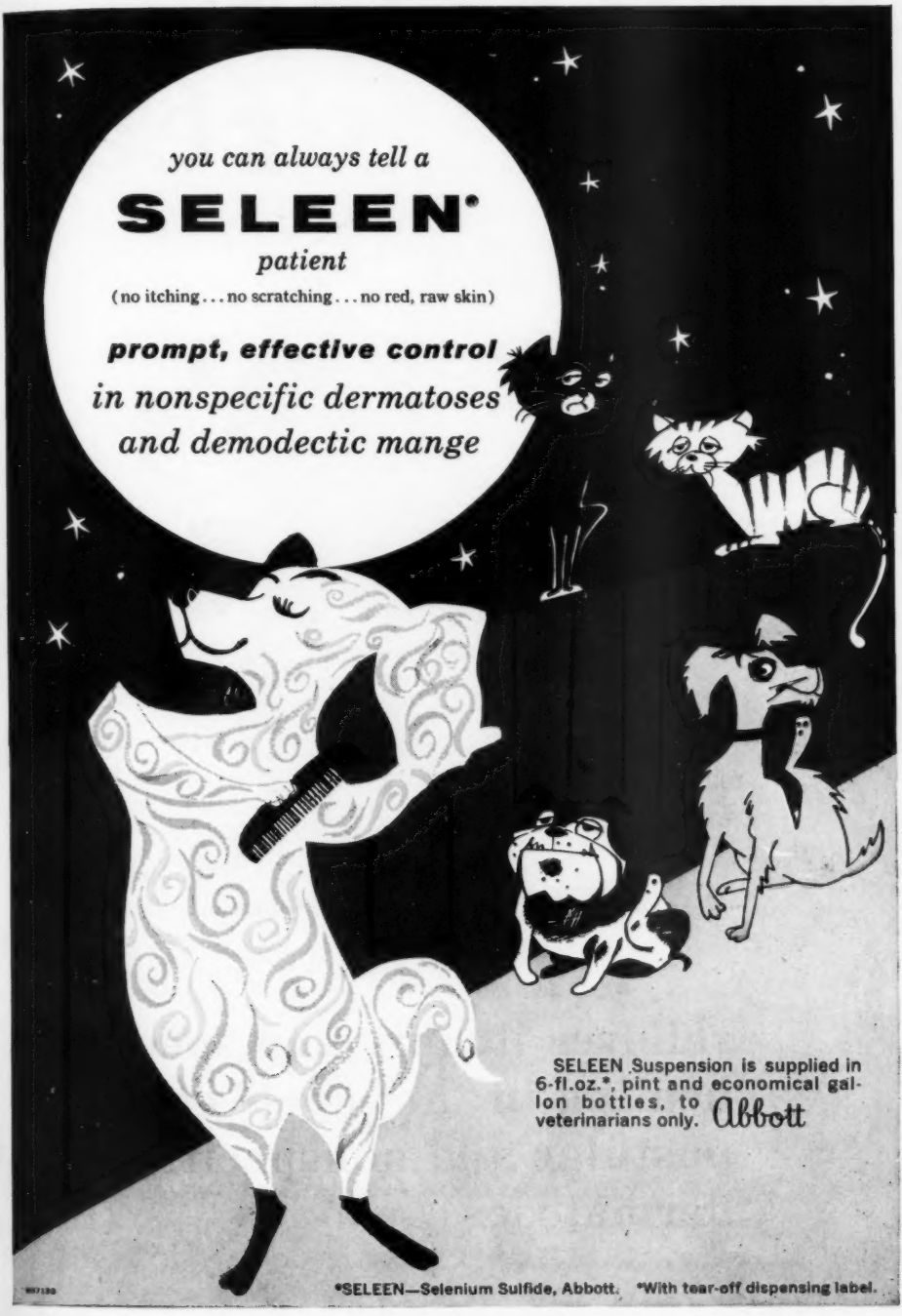
Education Costs

An interesting item in the summer issue of the Southeastern Veterinarian show that it costs a married student a total of $11,073.85 to go through four years (46 months) at a veterinary college. Delayed earnings for the four year period added to the above make a total cost of $33,073.85 for the education.

If he practices six days a week for 30 years it costs him $3.52 a day "just to be a veterinarian." These statistics hammer home one more reason why fees should be adequate but equitable.

Bloat Control

Kansas State College researchers have found that linseed oil meal is effective for reducing the number and severity of bloat cases in cattle. Mucin in the meal helps break down bubbles so that gas can escape instead of remaining imprisoned in froth. Earlier experiments at Iowa State indicated that various kinds of oil were good for preventing bloat.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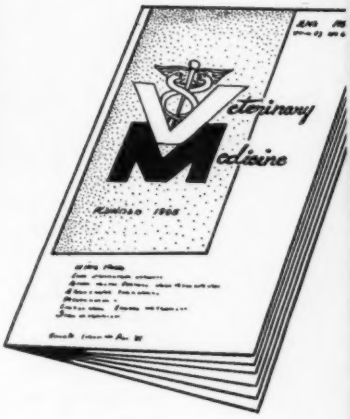
Robert L. Anderes, D.V.M.

1902-1958

SINCE its establishment in 1905," wrote Dr. Robert L. Anderes, not many months ago, "the objective of the magazine now familiar to thousands of readers as VETERINARY MEDICINE has been to provide the practitioner with information not available elsewhere. Fifty-two years of continuous publication have provided the journal with its abiding faith in the profession."

Last month, after nine years on a job that is one of the toughest in veterinary journalism, Doctor Anderes, publisher and editor of VETERINARY MEDICINE, had indeed proved his "abiding faith in the profession." With the death of Doctor Anderes came a flood of telegrams and messages from practitioners, scholars, government veterinarians, industry directors, stockmen, farmers, journalists — colleagues all — who spoke of the dull and desolate pain the passing of Doctor Anderes had brought not only to the profession, but friends of the profession as well. During the last decade of his vivid and crowded 56 years, he was so vigorously in the mainstream of veterinary progress that much of what he said and did will remain vital for years to come.

The last few days of his life were typical. His editorial pencil, like an added appendage, had flashed tirelessly. He seldom spared himself. In scalpel-like strokes he laid bare the facts on manuscript after manuscript until on Friday night, July 18, he signed the last bit of copy with the symbol "30," a code with which editors usually indicate to printers the "end of copy." On Sunday he flew to Chicago on business, a part of the

Dr. Robert L. Anderes, editor and publisher of VETERINARY MEDICINE, is shown here receiving the Distinguished Service Award in Veterinary Medicine from Kansas State College. Dr. A. D. Weber is making the presentation.

continuing battle he fought for veterinary medicine. The following day, shortly after 12:00 m. the word came to a shocked profession. Doctor Anderes had died suddenly, probably after suffering a cardiac seizure.

Doctor Anderes is survived by his wife, Catherine; two children, Robert Lawrence, and Kay Sandra; his mother, Mrs. Otto Anderes; and a sister, Miss Verna F. Anderes. Funeral services were held July 23 at St. Andrew's Episcopal Church in Kansas City.

Kansas-born, Dr. Robert L. Anderes received his B. S. degree from Kansas State College in 1925. He returned for his training as a veterinarian a few years later, and was awarded his doctor of veterinary medicine degree from the same school in 1934.

Shortly after graduation he entered private practice with Dr. J. V. Lacroix at Evanston, Ill., later serving on the professional staff of Jensen-Salsbery Laboratories in Kansas City. He served six years in the Army Veterinary Corps during World War II, rising to the rank of colonel. After the war, Doctor Anderes returned to the private practice of veterinary medicine at Kansas City. In 1949 he purchased from Dr. D. M. Campbell the professional journal, VETERINARY MEDICINE, the oldest independent publication in the profession.

Doctor Anderes also served as president of the Kansas City Veterinary Medical Association. He was a member of the American Veterinary Medical Association, the Missouri Veterinary Medical Association, and an associate member of the American Animal Hospital Association. He contributed to his community by active participation in the Boy Scout movement as Scoutmaster of Troop 16, St. Andrew's Episcopal Church; he was a member of the

honorary Tribe of Mic-O-Say. He was also a member of Men of St. Andrew's and Sertoma International. His biography appears in Who's Who. The Distinguished Service Award in Veterinary Medicine was presented to him in 1957 by Kansas State College.

A Distinguished Editor

He contributed a number of technical papers to professional literature, and through his career greatly influenced the standard and content of veterinary journalism. Although he had been an earnest practitioner of small animal medicine, it was through steadfast pursuits in the role of editor and author that he earned distinction as being one of the country's foremost veterinarians. Throughout his editorial, literary and business career, the medium he published stood as a keen-sighted watchman, defining things in understandable terms that enabled veterinarians to keep the application of veterinary medicine on the path of professional regularity. He was possessed of the common characteristic of all successful editors. He was a crusader. His personality was so merged with the personality of the journal and a passion for anonymity that many were unaware of the man as a vigorous center of activity.

Professional colleagues have noted that there was little of the meteoric about the career of Doctor Anderes. He labored with calm dignity among his books, and he accumulated a fund of knowledge about veterinary medicine and the men who staff the profession that few have been able to duplicate.

He set a high standard of performance and charted the course of the journal in its march through the years. His plans for continuance of VETERINARY MEDICINE are already being carried out with attention to his philosophy of publication.

VETERINARY MEDICINE to be Continued

"By methods proved sound by experience," wrote Doctor Anderes (*Vet. Med.* 52:485 [Oct.] 1957), "VETERINARY MEDICINE is dedicated to explore every possible lead of potential value; encourage correspondence with the best qualified; keep alert to new ideas; sound out newer information, and present these items at the earliest possible moment. In this respect it is expected that this journal will continue to function in many respects as a free and open forum with ethical restrictions. Anyone qualified to have an opinion may be given space to present that opinion exactly as he would be extended the floor of his professional assemblies. All matters will be open to critical analysis . . ."

VETERINARY MEDICINE will continue to be published as a professional magazine, written by veterinarians and edited by veterinarians, as it has for over half a century. A Board of qualified veterinarians has assumed all editorial functions. Production and business matters will continue to be handled as in the past.

Before his death, Doctor Anderes — with typical foresight — made plans for the continuation of the journal. But he could hardly have guessed that there was so little time.

Yet those who were closest to Doctor Anderes — his family, his veterinary colleagues, his friends — know that the passing of an editor always comes early, because for the editor life is over at — "30."

Factors affecting the color of meat (beef) have been a matter of interest to research workers to whom the problem has been referred by slaughterers. Conclusions from observations and controlled experiments suggest that certain management factors (stress) are primarily responsible. Several possible preventive measures are discussed here, all of which seek to offset stress factors prior to slaughter.

Etiology and Possible Preventive Measures in the Dark Cutter Syndrome

HAROLD B. HEDRICK, Ph.D.

Department of Animal Husbandry
University of Missouri
Columbia, Missouri

THE color of beef muscle is an important factor in the grading of beef carcasses and the acceptability of retail cuts by the consumer. Under conditions that are encountered in the packing industry the color of beef muscle may vary from a bright cherry red to purplish black. Occurrence of dark cutting beef constitutes a sizeable annual loss to the processor and producer. Consumers associate dark color of beef with meat from old animals or meat that has deteriorated. Dark cutting beef in most instances has to be sold at a reduced price.

Responsible Factors

Factors affecting the color of meat have been a matter of interest to research workers for many years. Little, if any, information concerning dark cutting beef was published prior to the work of Hall and coworkers[1] and the National Live Stock and Meat Board Committee.[2] These workers conducted rather extensive investigations on the characteristics of dark cutting beef and the causative factors. Characteristics of dark cutting beef reported were abnormally high pH, low glucose, practically no glycogen, high inorganic phosphate, low oxidation potential and sticky, gummy texture. It was concluded by these workers that the cause definitely appeared to rest upon a deficiency of glycogen in the tissue at the time of slaughter.

Normally when a beef carcass is ribbed, the color of the muscle is purplish and upon exposure to the atmosphere brightens to a cherry red. Myoglobin is oxygenated to oxymyoglobin, the bright cherry red consumers associate with quality beef. In the case of dark cutting carcasses oxygenation of myoglobin to oxymyoglobin does not

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Presented at Stress Symposium sponsored by Jensen-Salsbery Laboratories, Kansas City, Missouri, December 10, 1957.

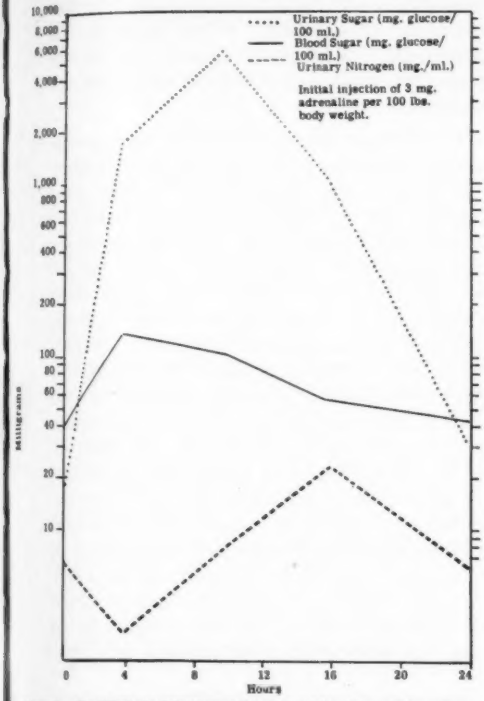
Urinary Sugar (mg. glucose/ 100 ml.)
Blood Sugar (mg. glucose/ 100 ml.)
Urinary Nitrogen (mg./ml.)
Initial injection of 3 mg. adrenaline per 100 lbs. body weight.
Milligrams
Hours

Figure 1. The Effect of a Subcutaneous Injection of Adrenaline on Urinary Sugar, Blood Sugar and Urinary Nitrogen Levels of Beef Cattle.

occur or if so at a much slower rate. The pH and dark color of muscle are closely related. At pH 5.4 the color of beef muscle is bright cherry red, at 5.8 the color is "shady" or dark red and at 6.2-6.8 purplish black. Membrane of the muscle cell is less permeable to oxygen at low hydrogen ion concentrations and myoglobin is not oxygenated. In addition to being less permeable to oxygen at low hydrogen ion concentrations, the membrane of the muscle cell is less permeable to the passage of moisture out of the cell therefore accounting for the characteristic sticky, gummy texture. It is of interest to note that when a small sample of dark muscle is placed in a blender and finely chopped, it brightens up almost instantaneously. When the muscle cells are torn apart and broken, oxygen then reacts with myoglobin to form oxymyoglobin.

In studies at the Missouri station it was found that steaks from dark cutting carcasses which were frozen and subsequently thawed lost less moisture due to drip than steaks from normal bright cutting carcasses. No relationship was noted between pH of steaks and organoleptic characteristics. Steaks from dark-cutting carcasses, as determined by a sensory panel for tenderness, flavor, juiciness, aroma and flavor, were found to be comparable to steaks from bright cutting carcasses of like grade and age.

It has been postulated by research workers that the amount of pigment or changes in the nature of pigments present may be responsible for the dark-cutting condition. However, from a study of the amount of pigments in light and dark colored beef, the National Live Stock and Meat Board Committee concluded that dark cutting beef is not caused by excessive amounts of pigments.

Occurrence of dark cutting beef still plagues the packing industry. In some lots of cattle there is a high incidence of dark cutters while in others there are none. This high incidence of dark cutters in cattle grading Good, Choice and Prime makes this condition of special significance to the processor. It has been observed that dark cutters are more prevalent during periods of inclement weather. Currently there is no means of successfully predicting dark color before an animal is slaughtered.

Situations of Stress

Cattle are subjected to various abnormal conditions during marketing and the preslaughter period. Many of these abnormal conditions, whether they be emotional excitement, exposure to adverse weather, trauma, or muscular fatigue, impose stress upon the animal's body. The animal is placed in an emergency situation. In order to survive, the animal calls upon its immediately available energy source first. Both the central nervous system and the muscles of a monogastric animal are almost entirely dependent upon glucose as an energy source for the performance of their functions. The ruminant utilizes short chain fatty acids in addition to glucose for its immediately available energy source.

When an animal is subjected to a stressful situation according to Himwich,[8] it re-

sponds with a number of physiological changes which are triggered by mechanisms in the hypothalamus. The sympathetic nerve centers located in the posterior part of the hypothalamus are aroused and nerve impulses are carried throughout the body to the vascular system and the organs involved in metabolism. The adrenal medulla receives secretory impulses through the splanchnic nerves which cause the discharge of adrenaline and noradrenaline. Funkenstein[4] stated that adrenaline elicits profound physiological changes in almost every system in the body. According to Best and Taylor,[14] adrenaline causes vasodilation in the skeletal muscles, reduction in blood volume due to transudation of fluid, causes a fall in blood pressure, inhibits the movement of the intestine, increases the rate and depth of respiration, causes hyperglycemia and glycosuria. Cori[5] clearly established in experiments in intact animals and on isolated organs that adrenaline accelerates the reaction glycogen ——> lactic acid in muscle and the reaction glycogen ——> glucose in the liver. Later Sutherland and Cori[6] reported that adrenaline accelerated this reaction by increasing phosphorylase activity. Stetten[7] has shown that the extent to which the administration of adrenaline raises the blood glucose level is dependent upon the past history of the animal. The greater the glycogen store in the liver and muscles the higher the resulting blood sugar level. From our data on blood and urine sugar collected from cattle that had been stressed, it appears that the level to which the blood sugar rises is governed by the renal threshold. The renal threshold for sugar possibly varies among animals.

Engel[8] stated that many factors are involved in maintaining metabolic homeostasis among which are the enzyme systems and the hormones. It is generally agreed that hormones do not initiate or halt metabolic reactions, but simply modify the rates of existing ones. It is not known whether this is brought about by hormones influencing enzyme activity or by modifying cell permeability to specific substrates. Hormones concerned with metabolism are probably being secreted at all times with the amount of each hormone secreted at any one time being determined in part by the needs of the organism. When either an insufficient or an excessive amount of any one hormone exists, physiological processes are disturbed.

It is commonly believed that all animals do not respond equally to a given stimulus. Some cattle are much easier excited than others. The environment in which cattle are raised and fattened has an influence upon the manner in which their physiological mechanisms react. Cattle that have been subjected to muscular exercise, abrupt changes in weather, excitement, et cetera, build up a defense against the effects of future exposure. These animals are better able to withstand stressful conditions when encountered during marketing and the preslaughter period than cattle that have not been previously exposed. The effect of intermittent physical and environmental stresses upon the homeostatic mechanism of a healthy animal, strengthens an animal's defenses against the various dangers which may beset it. This has been demonstrated with various laboratory animals by many

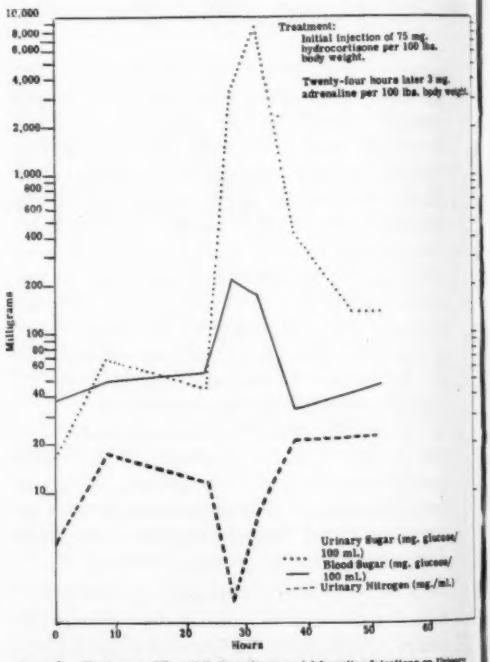

Figure 2. The Average Effect of Hydrocortisone and Adrenaline Injections on Urinary Sugar, Blood Sugar and Urinary Nitrogen Levels of Four Beef Cattle.

research workers. Mitchell and Hamilton[9] demonstrated that prolonged muscular training of cattle increased the glycogen content of the muscle.

Summary of Experiments

Studies conducted at the Missouri station during the past three years have been concerned with ways of producing the dark-cutting condition in the subsequent beef carcass, some of the physiological effects of stress and also some preventive measures. It has been reported many times that excitement is a strong stimulator of the sympathetic-adrenal mechanism. Cannon[10] reported that emotional excitement increases the secretion of the adrenal glands. Since adrenaline depletes muscle glycogen, the first attempt to produce the dark-cutting condition was to prod cattle periodically with an electric "hot shot" for 24 hours antemortem. Other cattle were given intramuscular injections of adrenaline to determine if it would produce the dark-cutting condition in the subsequent carcass. Feed and water were withheld during the 24 hour antemortem period. Two controls were likewise fasted 24 hours and slaughtered without being stressed. The results are presented in table 1. The carcass of the two animals stressed with the electric "hot shot" and the two receiving adrenaline 24 hours antemortem cut purplish black and were sticky and gummy. Administration of adrenaline five hours antemortem had a noticeable effect on both the color and pH of the muscle.

Cattle subjected to severe stress for 15 to 30 minutes prior to slaughter did not produce dark cutting carcasses. The muscle cut bright but the subcutaneous fat was "fiery." The common occurrence of "fiery" carcasses is due to improper bleeding at slaughter as a result of cattle being excited and under stress at the time of slaughter.

In order to determine the minimum amount of adrenaline required to produce a dark-cutting carcass, cattle were given subcutaneous injections of adrenaline 23, 15, and 7 hours antemortem. One third of the total amount was given at each time interval. The cattle had access to feed and water up to the date of slaughter. Results are presented in table 2 and show that 3 mg. adrenaline/100 lb. body weight will produce a dark cutting carcass. We have carried out numerous trials and find that a 3 mg. subcutaneous or intramuscular injection of adrenaline per 100 lb. body weight approximately 24 hours antemortem will deplete the muscle glycogen of cattle grading good and choice to the extent that the pH of the subsequent carcass 24 hours postmortem will range from 6.0-6.2.

The 3 mg. may be given all at one time or at varied time intervals and yield approximately the same results. The texture of muscle of pH 6.0-6.2 is sticky and gummy and the color is dark red. Approximately twice the level of adrenaline was required to deplete the muscle glycogen of Utility grade steers to the extent that the subsequent carcasses cut dark as for Good and Choice grade cattle.

During excitement the blood sugar level of an animal rises rapidly. We have meas-

TABLE 1. The Effect of Excitement and the Administration of Adrenaline to Beef Cattle on the pH and Color of the Subsequent Carcass

Animal no.	Live wt.	Carcass grade	Carcass pH	Muscle[1] color	Antemortem treatment
13	900	Good	5.4	A-4	Control
14	850	Choice	5.4	A-4	Control
15	765	Choice	6.7	A-10	Electric hot shot[2]
16	860	Good +	6.4	A-10	Electric hot shot
17	860	Choice —	5.8	A-7	5 mg. adrenaline/100 lb. body wt. 5 hours antemortem
18	785	Choice —	5.6	A-5	2.5 mg. adrenaline/100 lb. body wt. 5 hours antemortem
19	755	Good +	6.75	A-10	2.6 mg. adrenaline/100 lb. body wt. 24 hours antemortem 2.6 mgs. 12 hr. and 4 mg. 2 hrs. antemortem
21	715	Good	6.4	A-10	2.8 mg. adrenaline/100 lb. body wt. 24 hours antemortem 2.8 mg. 12 hr. and 4.2 mg. 2 hr. antemortem

[1]Munsell Color Paddles, Meat Scale A.
[2]Periodic excitement for 24 hours with battery operated "hot shot."

TABLE 2. The Effect of Varied Levels of Adrenaline Administered to Beef Cattle on the pH and Color of the Subsequent Carcass

Animal no.	Live wt.	Carcass grade	Carcass pH	Muscle* color	Antemortem treatment
47	775	Good	5.45	A-4	Control
49	700	Good +	5.55	A-4	1 mg. adrenaline/100 lb. body weight.
52	700	Good	5.75	A-8	2 mg. adrenaline/100 lb. body weight.
57	700	Good +	6.15	A-10	3 mg. adrenaline/100 lb. body weight.

*Munsell Color Paddles, Meat Scale A.

ured a two-to three-fold increase in blood sugar following a short period of excitement. Administration of adrenaline likewise causes a precipitous rise in blood sugar followed by a high level of sugar and nitrogen in the urine. Figure 1 illustrates the effect of adrenaline on the blood sugar, urine sugar and urinary nitrogen levels. The pH of the subsequent carcass was 6.0. The rise in urinary nitrogen is attributed to gluconeogenesis by the cortical hormones on protein. The level to which the blood sugar rises due to a given stress and the extent to which glycosuria is produced varies considerably from one animal to another.

When an animal's glycogen stores are diminished due to the increased secretion of adrenaline, other corrective physiological mechanisms are stimulated. Adrenaline stimulates the anterior pituitary to produce an excess of adrenocorticotrophin (ACTH) which in turn augments adrenal glucocorticoid secretion. The glucocorticoids accelerate the rate of gluconeogenesis from protein. Long, *et al.*,[11] have shown that a parallel rise in urinary nitrogen accompanies an increase in liver glycogen and blood glucose following an injection of cortical extract in rats. Saroff[12] reported an increase in circulating levels of 17-hydroxycorticosteroids in cattle following the administration of adrenaline or "hot shot" stimulation.

Preventive Measures

In addition to producing the dark-cutting condition and determining the factors involved, we have also been interested in preventive measures. Cattle were given injections of hydrocortisone to determine if an exogenous source of cortical hormone present during the period of stress would alleviate the pronounced effects of adrenaline on muscle glycogen. The administration of 75 mg. of hydrocortisone per 100 lb. body weight 24 hours prior to the administration of adrenaline in most instances produced carcasses of a lower pH and brighter color than cattle receiving adrenaline alone. These beneficial effects were most pronounced providing additional stress was not induced. Results presented in table 3 illustrate the variation in carcass characteristics obtained.

Figure 2 shows the effect of the administration of hydrocortisone and adrenaline on blood sugar, urinary sugar and urinary nitrogen. The initial rise in urinary nitrogen is attributed to gluconeogenesis from protein by the exogeneous hydrocortisone, the subsequent decline following adrenaline administration to an increase in urine volume, and the subsequent rise due to the activity of endogenous glucocorticoids and possibly to some extent exogenous hydrocortisone. The subsequent carcasses from these animals cut dark due to the depletion of muscle glycogen by the adrenaline.

Prior to our work, dark cutting beef had been produced experimentally by the National Live Stock and Meat Board Committee and by Howard and Lawrie[13] by the administration of convulsive doses of insulin. Whether the insulin used was a crude extract or pure insulin was not reported. The physiological function of insulin is to enhance glycogen deposition. We administered 250 units per 100 lb. body weight 22 hours antemortem and noted no deleterious effects on the subsequent carcass. In subsequent studies where we administered 100 units per 100 lb. body weight, we noted a lowering of the blood sugar level from 57 to 27 mg. after 20

hours. Following a short period of intense stress (15 minutes) with a "hot shot" the blood sugar level did not rise above the level prior to the administration of insulin. Likewise we obtained similar results when insulin was administered four hours prior to stress.

Recovery from Stress

The period required for cattle to recover following stress, if given feed and water, is also a matter of interest. Cattle given 3 mg. adrenaline per 100 lb. body weight 48 to 72 hours antemortem produced carcasses with pH values of 5.6 to 5.7. This indicates that cattle held 24 to 48 hours under optimal conditions with feed and water following stress of such a degree that would normally produce dark-cutting carcasses, will make a considerable recovery. During the recovery period the increased secretion of glucocorticoids play a major role in restoring glycogen to the muscles and liver. The rate of muscle glycogen replenishment appears to be a slower process than the rate of depletion caused by severe stress.

The extent of the recovery period following stress will depend upon the intensity and duration of the stress to which cattle are subjected and the environmental conditions under which they are held during the recovery period. Cattle that have been subjected to intense stress for a prolonged period may take several days to regain physiological normality. Whereas, cattle subjected to stress for a short period recover more rapidly.

Tranquilizers

Another possible preventive measure against dark cutting beef is the use of tranquilizers. We have investigated to a limited extent the use of some of the synthetic phenothiazine derivatives. Diquel (Jen-Sal) and Thorazine (Pitman-Moore) administered intravenously at the rate of 50 mg./100 lb. body wt. caused marked sedation within one or two minutes. Cattle which were extremely nervous and wild prior to the administration of tranquilizers could be approached easily and handled after treatment. Animals remained noticeably sedated for about five hours. Cattle receiving tranquilizer did not react as quickly to the stimulus of a "hot shot" as controls. However, after a short period of intense stress blood sugar level of tranquilized animals increased comparable to that of controls. It was observed that the fecal material of the tranquilized cattle remained firm when stressed while the controls became watery and thin. Some of the abnormal characteristics of cattle receiving tranquilizer which were noted were: Cattle were somewhat listless, ears slightly drooped, a slight closure of the palpebral fissure and ataxia. Intramuscular injections of 100 mg./100 lb. body weight also caused sedation but not as noticeable as did the intravenous injection. No subsequent deleterious side effects were observed following the administration of either of the two drugs employed.

Additional studies must be made before a definite statement can be made as to the value of tranquilizers in preventing the dark-cutting condition in cattle. If the ad-

TABLE 3. The Effect of Hydrocortisone Administered Prior to the Administration of Adrenaline to Beef Cattle on Subsequent Carcass Characteristics

Animal no.	Live wt.	Carcass grade	Muscle pH	Muscle color	Hydrocortisone (mg./100 lb. body weight	Antemortem Hydrocortisone (hr.)	Adrenaline (mg./100 lb. body weight)	Antemortem Adrenaline (hr.)
74	800	Choice —	6.0	A-9	75	48	3	24
70	700	Choice	5.6	A-6	75	48	3	24
81	650	Choice —	5.55	A-7	75	72	3	48
76	650	Choice —	5.7	A-8	75	72	3	48
79	600	Good	5.5	A-4	Control			
68	850	Choice	5.45	A-5	Control			
80	730	Choice —	5.8	A-8	75	52	3	24

ministration of tranquilizers will prevent dark-cutting beef there still remains the problem of determining whether or not the edible portion of the carcass would be safe for human consumption following tranquilization.

Summary

Dark-cutting beef is caused by cattle being subjected to stress such as excitement for approximately one day or longer. Stress arouses the sympathetic nervous system and it in turn stimulates the adrenals to secrete adrenaline. Adrenaline mobilizes blood sugar at the expense of tissue glycogen. Muscle glycogen of a normal animal is not depleted in a few minutes or even an hour or two. All animals do not react alike to a given stress. A normal animal is able to withstand short periods of stress; it is when stress is prolonged and muscle glycogen is depleted that dark-cutting beef occurs.

Possible preventive measures against the occurrence of dark-cutting beef are: A period of rest and adequate feeding immediately prior to slaughter; protection from inclement weather during shipment and marketing; handling of cattle during marketing so as to prevent excitement; administration of glucocorticoids to aid in the restoration of glycogen; the administration of insulin to depress the blood sugar level; and the administration of sympathetic blocking agents such as tranquilizers to enable cattle to withstand the various stresses prior to slaughter.

This work was supported by a grant-in-aid from the National Live Stock and Meat Board and funds from the Missouri Agricultural Experiment Station. Tranquilizers used were supplied by Jensen-Salsbery Laboratories. Hydrocortisone was supplied by The Upjohn Company.

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Chlorophyllin in Wound Therapy

Plant extract chlorophyllin may play an important role in speeding up healing of infected wounds, according to report by Miller, *et. al.* (*Am. Jour. Surg.*, 95:967 [June], 1958).

Action of the extract (sodium-copper chlorophyllin—Rystan) inhibits conversion of fibrinogen to fibrin by thrombin. This inhibiting effect on the fibrin-clotting mechanism may help considerably in controlling inflammatory reaction in open wounds. Fibrin may provide a chemical or mechanical barrier to phagocytosis and by selectivity in permeability may permit albumin to filter through but not globulin, containing antibodies. Fibrin increases viscosity of edema fluids, and fibrin induced thrombi may be responsible for swelling and tissue anoxia.

An Aid to Collection of Semen by Electroejaculation

Chlorpromazine Hydrochloride

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TRANQUILIZERS are a relatively new class of drugs, and clinical observations concerning their effects in domestic animals thus are of considerable interest to veterinarians. The particular advantages of these drugs relate to their antiemetic and central depressant actions, and their enhancing effects on the actions of other anesthetics and sedatives.[1,2]

Tranquilizers depress the autonomic nervous system as well as the central nervous system. Thus, muscle tone, endocrine secretions, and vasodilatation may be affected.

One of these drugs, chlorpromazine hydrochloride (Thorazine*—S.K.F.) has been particularly useful in the examination of bulls, especially in the examination of the penis.[2] In 63 bulls treated with this tranquilizer, in lieu of epidural or pudenal nerve block, to facilitate examination of the penis, individual responses varied considerably. However, satisfactory relaxation of the penis was accomplished in 56 of the animals. The drug was given intramuscularly in doses of 0.1 to 0.5 mg. or intravenously at the rate of 0.1 mg. per pound of body weight.

Satisfactory results obtained with chlorpromazine hydrochloride in examining the penis prompted trial with the drug in collection of semen by electroejaculation.

The electroejaculation technic makes possible collection of semen and fertility testing in bulls that will not serve an artificial vagina. Many of these bulls are highly nervous, and often so frightened when restrained that they fail to ejaculate.

*The Thorazine (trademark of Smith, Kline and French Laboratories) used in this study was supplied through the courtesy of Pitman Moore Company, Indianapolis, Ind.

TABLE 1. Evaluation of Semen Obtained from Thorazine-Tranquilized Bulls by Means of Electroejaculation on 0.1 mg./lb. Dosage Intramuscular

Bull no.	Age (yr.)	Breed	Results	Amt. of ejaculate (cc.)	Motility %	Density (1-2-3-4-5)	Longevity: Semen extended (in days) 40°F	Morphology (% abnormal sperm)
1	2.0	Angus	Only slightly depressed	4	70	3.5	3	30
2	2.5	Angus	Depressed, ejaculated in sheath	3.5	50	2.0	1	60
3	3.0	Hereford	Quiet (30 minutes)	6.0	75	4.5	6	10
4	6.0	Holstein	Quiet (normal)	7.5	85	4.0	5	15
5	4.5	Jersey	Quiet (20 minutes)	4.0	70	2.5	2	20
6	5.0	Brown Swiss	Depressed in 30 minutes	6.5	75	4.0	5	15
7	5.0	Holstein	Quiet in 30 minutes	8.0	60	3.5	6	20
8	2.0	Angus	Uncontrollable	....	....	....	..	....
9	2.0	Shorthorn	Refused to ejaculate	....	....	....	..	....
10	7.0	Guernsey	Ataxia when released	3.0	65	3.5	2	40
11	8.0	Angus	Quiet	8.0	90	4.5	2	30
12	5.0	Guernsey	Normal quiet behavior	4.0	80	3.5	5	20
13	4.0	Hereford	Depressed	5.5	60	4.0	6	15
14	3.5	Angus	Uncontrollable	....	....	....	..	....
15	6.5	Jersey	Unusually quiet	3.5	85	5.0	7	30
16	8.0	Holstein	Quiet	7.0	80	4.0	6	9

The intravenous injection of 0.1 mg. of chlorpromazine hydrochloride per pound of body weight produced relaxation in three to six minutes to such an extent that the penis was relaxed by the time electroejaculation was started. Thus, in many instances, either erection was not obtained, or ejaculation would occur within the sheath. This results in collection of unsatisfactory semen specimens.

Intramuscular injection of 0.3 mg. of chlorpromazine hydrochloride per pound of body weight (250 to 300 mg. for the average 1,000-lb. bull) produced depression within 12 to 20 minutes. In many cases, the penis would remain extended for several hours, necessitating keeping the bull restrained or putting a sling on the penis. Consequently, chlorpromazine hydrochloride was given in various dosages until a dose of 0.1 mg. per pound, given intramuscularly, was found in most bulls to produce slight depression without penis prolapse. Electroejaculation then caused erection in the majority of bulls tested. However, since the response of individual bulls was variable even at the 0.1 mg. per pound level, retreatment often was necessary. Partial closure of the eyelid or a sleepy appearance was used as a criterion for determining the desired level of depression, although this sign too varied between individuals.

Sixteen bulls of all breeds (table 1) were treated with 0.1 mg. of chlorpromazine hydrochloride per pound of body weight intramuscularly. These bulls were quiet and cooperative when restrained in a standard chute within 20 to 25 minutes after treatment. Electroejaculation was started immediately after animals were restrained. Satisfactory specimens were obtained from 13 of these bulls, whereas three failed to yield semen.

Evaluation of semen produced by motility and density standards, and morphology and longevity studies, when diluted and stored at 40 F., did not reveal facts regarding possible effects of chlorpromazine hydrochloride on spermatozoa, because semen from the same bulls, when they were not tranquilized, was unavailable.

Semen was obtained by electroejaculation from ten bulls of known fertility after they had been given 0.1 mg. of chlorpromazine hydrochloride per pound of body weight intramuscularly. Studies of these specimens were compared with results of earlier studies in the same bulls. No significant differences could be observed, but conception rates were not used for comparison.

Summary

Thorazine (chlorpromazine hydrochloride) facilitates the examination of the penis in bulls. Satisfactory relaxation is obtained with 0.1 to 0.5 mg. intramuscularly, or 0.1 mg. per pound of body weight intravenously. A lower dosage (0.1 mg. of chlorpromazine hydrochloride per pound by the intramuscular route) gave tranquilizing effects, yet allowed penile erection and ejaculation to occur. While variations occurred between bulls, the level of 0.1 mg. per pound appeared to give the desired effects for electroejaculation.

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Antibiotics in Milk for Cheese

In general, antibiotics are relatively stable to heat, so that pasteurization or even sterilization of milk will not destroy the inhibitory effects on cheese starters and lactic acid producing microorganisms.

A number of investigators have confirmed that if antibiotics from a single infusion recommended for treatment of an infected quarter would be available in milk at one time, it would be sufficient to inhibit acid production almost completely in nearly 1,000 lb. of milk.

CASE REPORT

Bovine Encephalo-Meningitis

Associated with

Erysipelas Infection

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Erysipelothrix rhusiopathiae infections are well known in several species of domestic animals and in man. Reported cases of erysipelas in cattle are relatively rare, however, and of those described, none was reported to involve the central nervous system. In 1953, Moulton, *et al.*[1] reported erysipelas arthritis in calves in California in which six of a herd of 20 were affected. The lesions were limited to the joints and were characteristic of a rheumatoid response. The purpose of this report is to describe the clinical and laboratory findings of a case of bovine encephalomeningitis apparently due to erysipelas infection.

Clinical Observations

In June, 1957, a call was made to a large ranch located in a remote section of central Florida. The ranch is composed of approximately 10,000 acres, half of which are in improved pangola grass pasture and the remainder in swampland. Wild hogs are known to be present in this area in small numbers but any that are seen are exterminated as promptly as possible, There is no history of any disease having been observed in these animals. The object of the call was a yearling heifer exhibiting central nervous system symptoms. The animal held its head high (opisthotonos) in a "star gazing" position. It appeared to be blind and ran into fences and other objects. Treatment with 50 ml. of a 30% solution of sodium thiosulphate intravenously and Terramycin (Pfizer) (1 gm.) intramuscularly resulted in an uneventful recovery.

Subsequently, a second animal from this ranch became similarly affected and died. When a third animal became ill with similar symptoms it was moved to the veterinary clinic (Whaley) for necropsy. At this point it was recumbent and unable to rise.

The three animals originated in separated herds of approximately 200 head each which were grazing on individual 100 acre pastures of pangola grass.

Necropsy

Postmortem examination revealed no gross lesions of diagnostic significance. There was slight reddening of part of the abomasal mucosa resulting in a "cooked" appearance. Blood vessels of the brain were noticeably injected. The pyramidal area of the kidneys was congested and the urine was a dark amber color. Specimens of the liver, kidney, and brain were preserved in 10% formalin and one-half of the brain was packed in dry ice for shipment to the Pitman-Moore Company Laboratories, Zionsville, Ind. for histopathological studies.

Laboratory Findings

Histopathological studies revealed inflammatory changes in the meninges and inflammation and edema of the surface of the brain. The meninges were thickened by edema and infiltration of reactive cells. Hemorrhages and small clumps of Gram-positive rod-shaped bacteria were scattered throughout the meningeal layers. The brain stem seemed to be most drastically affected, with the cerebellum next in severity. An organism was isolated from the brain which had the cultural, morphological and biochemical characteristics of *Erysipelothrix rhusiopathiae*.

Animal inoculation studies were made with the organism. All of several mice inoculated with a suspension of the pure culture died within five days and the same organism was recovered. One group of mice

was then given 0.5 ml. each of commercial erysipelas antiserum and a similar group was left untreated. Each mouse was then inoculated with pure culture suspension of the organism under study. All of the untreated mice died within five days and typical organisms were recovered from these tissues, whereas, all the serum protected mice remained healthy. A rabbit which was inoculated in an effort to determine whether listeriosis or Aujeszky's disease was present remained clinically healthy.

Summary

A case of bovine encephalo-meningitis apparently due to *Erysipelothrix rhusiopathiae* is reported. An organism isolated from the brain showed consistent cultural, morphological and biochemical properties of *E. rhusiopathiae*. It was uniformly pathogenic for mice. The pathogenicity was neutralized by the concomitant administration of erysipelas antiserum.

Two other cases with similar clinical symptoms occurred on the same ranch at about the same time but a definitive diagnosis was not made. One of these recovered and a second was fatal.

This is apparently the first case of this nature to be reported.

The writers extend their thanks to Mr. Gayle Niksch, Pathology Research Laboratory, Pitman-Moore Co., for his able technical assistance in the case.

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Grub Control

In trials late in 1957, 100,000 head of livestock were subjected to grub control treatment involving the systemic insecticide Dow ET-57. Given the trade name Trolene, this complex compound was available for wide use this summer and fall.

Phenomenal reports indicate better than 90% effectiveness in grub control during the past season's trials. Cost of treating an average steer ranges from $1. to $1.50, but gains are claimed to exceed ¼ lb. per day in treated over untreated animals under identical management. A net of $5.71 gain per head is said to be a direct result of treatment for grubs.

General recommendations for treating animals call for treatment to begin in July and continue through September in the South and from August through October in the northern states. Treated animals must be withheld from slaughter for at least 60 days. It is understood that farmers and ranchers will be offered the product by the Dow Chemical Co. in bolus form (1 bolus for each 300 lb. body weight) through feed store outlets.

Iron-Dextran in Pig Anemia

Many practitioners are reporting excellent results following the intramuscular injection of iron dextran complex for the prevention of baby pig anemia. Pigs are injected once in the gluteal region when two or three days of age.

The Mayo Clinic Proceedings (Dec. 11, 1957) also report good results in man, if the anemia is definitely due to iron deficiency.

It appears that if piglets are treated early that secondary infections such as scours, pneumonia, transmissible gastroenteritis are also reduced. Furthermore it is reported that market weights are reached two weeks earlier in treated pigs as compared with untreated ones and with considerably less feed. The older methods of handling anemia with pieces of sod or iron sulphate solution painted on the sow's udder is still effective, but lacks the efficiency of intramuscular iron dextran complex.—*R. R. Dykstra, D.V.M.*

Vitamin A deficiency in turkeys as an adjunct to keratoconjunctivitis has been re-evaluated by the authors. Evidence that individual birds on free choice grains and supplements could develop a conjunctivitis due to vitamin A deficiency is presented. Also discussed are environmental factors.

Keratoconjunctivitis in Turkeys

II. The Relationship of Vitamin A, Infectious Agents and Environmental Factors to the Disease

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A preliminary report on keratoconjunctivitis was made in 1956.[1] In this report evidence is presented to indicate that while vitamin A deficiency may be the primary cause of certain outbreaks of keratoconjunctivitis, it may have no apparent relationship to the problem in other outbreaks.

A questionnaire was sent to 13 flock owners in South Carolina to determine the incidence of the disease and other observations. Nine of the 13 had experienced the disease in breeder flocks during the colder months of the year. Two reported it as early as 1950. In addition to references supplied in the preliminary report, a disease referred to as "turkey eyelid necrosis" was described in 1956,[2] as well as granulomatous chorioretinitis.[3] A rickettsial conjunctivitis in chickens has been reported.[4] The isolation of pleuropneumonia-like organisms (PPLO) from the eye of chickens and turkeys appears to be common knowledge, among scientists working with PPLO. Eye lesions have been reported in chickens inoculated with *E. coli*.[5] The aqueous humor of the eye in chickens has been reported as a reservoir for Newcastle disease virus.[6,7]

Materials and Methods

During the year 1957, four outbreaks of this disease were studied and during 1958 two additional outbreaks. The appearance of eye lesions in all six outbreaks were indistinguishable from each other. Examinations for bacteria, viruses, and PPLO were made from living cases in the field and from heads from recently decapitated turkeys. In addition, living birds had been presented to the laboratory for diagnostic purposes from each flock. Numerous birds, confined in a so called sick pen, were also studied in most instances. Affected birds were also obtained for pen transmission experiments.

Experimental exposure of normal eye

tissues to Newcastle virus, bronchitis virus, fowl pox virus, avian PPLO, and a number of species of bacteria, was accomplished by using 36 mature turkeys raised free from any known exposure to infectious diseases or vaccines. Experimental flocks were exposed to climatic conditions similar to the exposure of affected flocks in the field. Twenty-four additional mature turkey hens were also available to study the effects of mechanical injury and the effect of night lights on the eye. Lights were automatically controlled in some pens and were absent in others. Two lighted pens contained two 150 watt bulbs placed 6 ft. apart and 6 ft. from the ground.

Livers for assay from affected and control birds were obtained on the premises and frozen. Commercial feed samples were obtained from previously unopened sacks at the turkey grower's farm and consisted of a filled quart container. All specimens for assay were shipped to the Wisconsin Alumni Research Foundation located at Madison, Wisc.

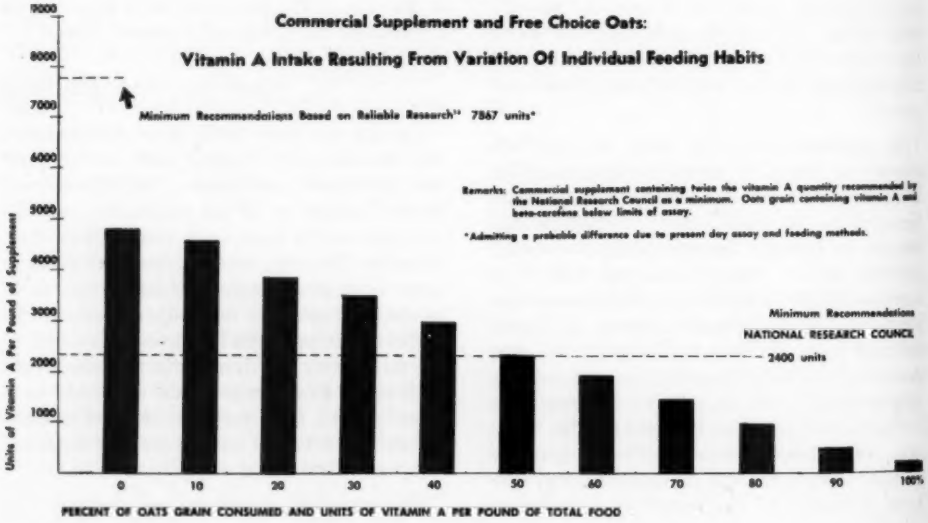
Results

Bacterial and mycotic isolations from affected eyes were inconsistent, revealing the presence of microorganisms that were incapable of reproducing the disease experimentally, yet which were probably capable of producing secondary infections. Methods of transmission by mechanical means and pen exposures were exhausted without success with one exception. One bird died of acute erysipelas five days after being injected in the eyelid with triturated eyelid from a bird affected with conjunctivitis. The dead inoculated bird, it was determined by bacteriological examination of the internal organs, was affected with erysipelas. All attempts to experimentally reproduce the disease with bacteria and molds isolated, field strains of PPLO, and commercial Newcastle disease, infectious bronchitis, and pox viruses failed except for one bird inoculated into the nictitating membrane with PPLO. This latter bird developed a disease indistinguishable from field cases of keratoconjunctivitis. Additional attempts to reproduce an eye disease by similar methods of exposure with PPLO failed.

Attempts to experimentally reproduce the disease with field strains of *Erysipelothrix rhusiopathiae* and *Pasteurella avicida* failed and usually resulted in acute fatal infections.

The results of mechanical injury of the corneal tissue with a hypodermic needle provides some evidence that the corneal tissue of turkey hens under night lights is more sensitive to injury and more reluctant

FIGURE 1.



to heal than the corneal tissue of birds not under night lights. The eye and associated structures of the healthy adult turkey are surprisingly resistant to irritation. Even when such injury is applied until blood appears at the site of injury, little or no inflammatory reaction is detected on later periodic observations.

The seven vitamins listed in table 1 were selected for a preliminary assay of livers of affected birds because of the fact that a deficiency of any one of these could possibly be associated with an eye disease problem. Assay results revealed a difference in the vitamin A and vitamin E liver values, between the eye-disease birds and the non-eye-disease control birds. In view of these findings, additional investigations along these lines were confined to assay values of vitamin A and vitamin E. Tables 1 and 2 summarize the vitamin A and vitamin E values of the livers of affected and control birds of the four flocks studied.

The results of the investigation of the vitamin A and vitamin E values of livers in flock 3 provided conclusive evidence that a frank vitamin A deficiency was present.

In view of liver assay results, the owner of one premises affected during 1957 used a commercial feed during the 1958 season fortified with 8,000 units of synthetic vitamin A per pound and 50,000 units of synthetic vitamin E per ton. During January, a severe outbreak of keratoconjunctivitis ap-

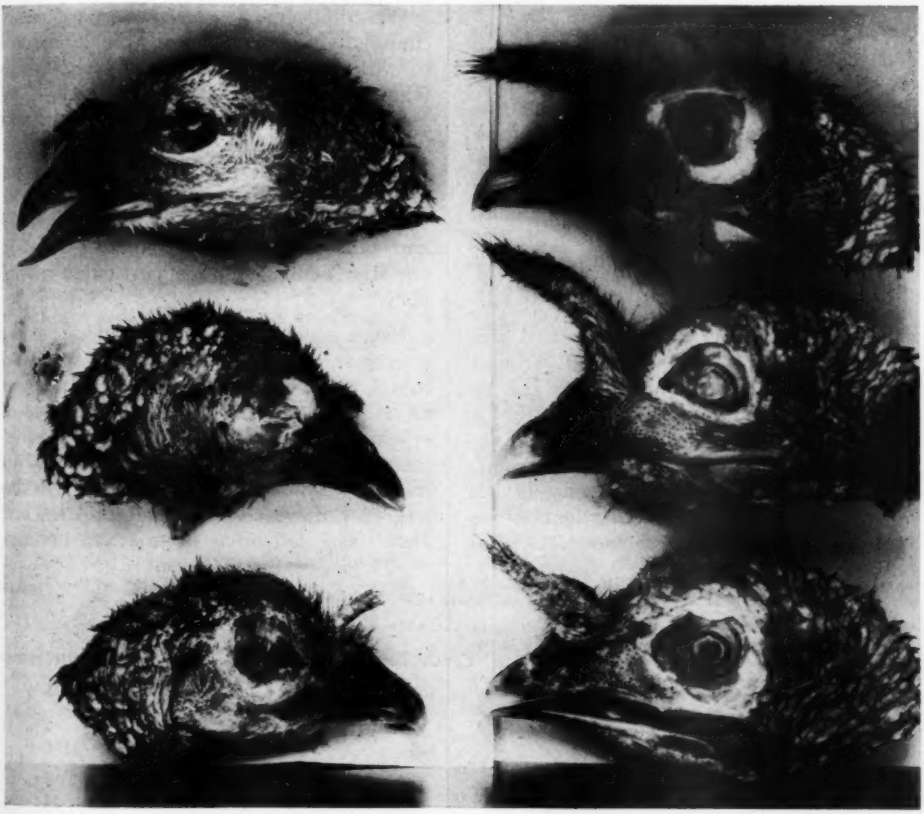


Fig. 2. Left: (upper) Demonstrating the presence of a severe conjunctivitis. (middle) illustrating thickened eyelids and the conjunctival sac filled with cheesy matter. (lower) Eyelids removed to show the presence of the cheesy matter. Right: (upper) Revealing ulceration of the cornea, eyelids removed. (middle and lower) Demonstrating the presence of a severe keratitis with extensive destruction of corneal tissue, eyelids removed.

peared in one breeder flock on the fortified feed. The vitamin A values of pooled egg yolks from this flock were 3,000 units/100 grams one month prior to the outbreak and 2,800 units/100 grams during the outbreak. Similar assay of pooled egg yolks from normal flocks revealed a favorable relationship, being 2,900 units and 2,800 units/100 grams respectively.

Discussion

In view of the occurrence of the severe outbreak of keratoconjunctivitis in a flock consuming a ration highly fortified with vitamin A, it was necessary to re-evaluate all prior convictions that the eye problem was necessarily due to a simple vitamin A deficiency. The fact that one flock studied during 1957 was affected with avitaminosis A appeared to be undeniable, yet the fact that another flock studied during 1958 was affected with an indistinguishable eye disease in the presence of adequate vitamin A is equally undeniable. The severe 1958 outbreak of keratoconjunctivitis began to appear when the temperature suddenly dropped to sub-freezing and remained in that vicinity for a period of about nine days, at which time approximately 30% of the flock showed evidence of the eye disease. The wind velocity during this same period was persistently high and averaged around seven miles per hour. This velocity can be better appreciated when one realizes that a large attic-type exhaust fan, used to experimentally expose birds to air current, was only creating a wind velocity of 3.2 miles per hour. Further investigation revealed three significant factors: (1) Absence of range shelters, (2) absence of windbreak fences, and (3) use of nests constructed with wooden slats, designed to protect birds from summer heat rather than winter cold.

The lower vitamin A liver storage of affected birds has caused Barnette to suggest the similarity of keratoconjunctivitis to hyperkeratosis in cattle.[16] Others have suggested a possible allergy.

The fact that one other minor outbreak of keratoconjunctivitis occurring during 1958 was in a flock affected with erysipelas, also appeared to be a possibly significant observation. This finding is not a new observation or concept, but has already been suggested by Peterson as a possible cause of keratoconjunctivitis in turkeys.[8]

What appears to be an analogy to keratoconjunctivitis in chickens, "the symptoms of which resembled those of 'roup' more than any other disease" was described by Beach in 1925.[9] He relates: "Outbreaks have been confined largely to periods of the year when dry or cold conditions, or both, made it difficult to raise green food. These periods comprise the late summer and fall months before the first rainfall, and the winter months, particularly January."

Beach conclusively demonstrated that the disease he was studying was due to a vitamin A deficiency. He found an ophthalmia to be present in less than 50% of diseased chickens. The nature of the eye involvement in chickens as described by Beach is indistinguishable from the current eye disease in turkeys. While it is quite true that Beach reported other postmortem findings,

TABLE 1. Preliminary Assay of Turkey Livers from Affected Breeder Flocks

Vitamin	Flock no. 1		Flock no. 2	
	Eye disease	Control normal	Eye disease	Control normal
A units/gm.	238	408	340	475
E mg./100 gm. (total tocopherols)	1.74	2.34	1.63	2.46
Niacin micrograms/gm.	124	180	130	136
Pantothenic Acid micrograms/gm.	68.95	73.75	60.74	79.54
B-2 micrograms/gm.	22.56	21.60	18.6	23.4
B-12 micrograms/gm.	0.50	0.54	0.71	0.78
C mgs./100 gm.	24.4	25.4	28.3	24.7

Remarks: Assays performed from 10 pooled livers from each eye disease flock and from 6 pooled livers from each normal control flock.

including pustules in the pharynx, and deposits of urates in the kidneys and on the abdominal viscera, we must keep in mind that present day deficiencies are almost always of a borderline nature and are rarely frank deficiencies. Hinshaw, who studied vitamin A deficiency in turkeys in an exhaustive manner, relates that sometimes the only manifestation of vitamin A deficiency in turkeys is that of an eye disease.[10] Hinshaw and Lloyd,[11] in summarizing the gross lesions of vitamin A deficiency in turkeys, revealed that an eye disease predominated over other lesions.

Fenstermacher[12] has observed outbreaks of an eye disease in turkeys which often responds to an increase in the cod-liver oil content of the regular ration. He refers to the disease as "scabby eyelids." The disease sometimes reappeared after the use of cod-liver oil was stopped, and in some instances no beneficial effect from the use of cod-liver oil was noted. In 1951, Asmundson and Kratzer[13] reported on a vitamin A deficiency in turkey stock resulting from the use of a low carotene alfalfa meal. Many of the birds developed "watery eyes followed by the accumulation of caseated matter in the eyes and blindness." Birds that died of the disease presented other classical evidence of a vitamin A deficiency. The breeding flock eventually recovered, except for blindness, following the use of a high potency vitamin A oil.

A number of pertinent facts must be considered, any one of which could contribute to a vitamin A deficiency. So called stable synthetic vitamin A is only relatively stable and may break down as a result of aging and the heat and pressure created during pelletizing.[14] The fact may not be adequately recognized by commercial nutritionists that turkeys require three to four times as much vitamin A as chickens and may not be able to utilize certain vitamin A containing feeds as efficiently as chickens.[15] In fact, vitamin A requirements for adult turkeys in a state of productivity based on a study of blood serum and liver storage values have yet to be established.

In the course of this investigation, it was learned that free choice oats grain, used in the so called oats-commercial supplement system of feeding, contained practically no vitamin A. In feeding systems of this nature, it is a case of simple mathematics to understand that the birds of the flock which do not properly balance their oats grain and supplement can easily develop a vitamin A deficiency, by eating a proportionately large amount of oats grain. (See fig. 1) Furthermore, some growers insist that keratoconjunctivitis has disappeared as a flock problem since a complete ration was adopted in place of the free choice-supplement method of feeding.

The eye disease under discussion is one that begins with a swelling of the lower eyelids and later the nictitating membrane. By comparing both the right and left dissected eyelids of affected birds to the dissected eyelids of non-affected birds, it becomes evident, that both eyelids of affected birds are swollen. Clinically, however, it appears that only the right or the left eyelid is affected. A frothy discharge, then cheesy matter soon appears. Usually one eye is so affected.

The typical course includes a recovery phase in which the lower eyelid shrivels and dies. Moore described this necrosis in 1956. The progress of the disease is hastened by

TABLE 2. Vitamin A and E Liver Assay Values of Eye Disease Turkeys

Flock no.	Vitamin A, units/gm. Eye disease	Controls	Vitamin E, mgs./100 gms. Eye disease	Controls	Environment	Age	Control source
1	238	408	1.74	2.34	Winter, pasture tough	Adult breeder	Same flock different section
2	340	475	1.63	2.46	Winter, pasture tough	Adult breeder	Nearby younger adult flock
3	10	23	1.42	1.31	Confined, no pasture	17 weeks	Same flock
4	213	378	2.18	3.12	Summer dry, pasture tough	Large growing	Same flock

rubbing the affected eye on the wing feathers and by picking of the affected tissues by other birds. Low grade infections must appear early, and the determination as to what species of bacteria or fungi become involved is determined by the nature of the microflora that abound on the premises.

No intracellular bodies have been observed in preparations from affected conjunctival scrappings. This, together with repeated failures at transmission, and the incidence of the disease during periods of low insect population, is evidence that Coles' chicken conjunctivitis rickettsia was not present.

Summary and Conclusions

Keratoconjunctivitis, also referred to as blepharoconjunctivitis, scabby eyelids, eyelid necrosis, and eye disease, appears in turkey breeder flocks and to a lesser degree in large growing turkeys. The more severe outbreaks occur during the coldest months of the year and appears to have increased in incidence since 1950. The condition begins with a swelling of the lower eyelids, is usually pronounced in but one lid, and progresses to a frothy discharge, swelling of the nictitating membrane, cheesy matter that may become voluminous, and clouding and ulceration of the cornea. Once established the course of the disease becomes irreversible, and resolution is preceded by a necrosis of the lower eyelid.

Efforts to isolate a primary infectious agent have met with failure with the possible exception of one minor outbreak in which it was demonstrated that erysipelas may have been related to the problem. Secondary invaders are related to the flora of the premises.

Efforts to reproduce the disease by pen exposure, by mechanical transmission, and by other experimental means have met with failure, with the exception of one bird, the nictitating membrane of which had been injected with a recently isolated strain of avian PPLO. This later achievement could not be satisfactorily repeated.

Assay of livers provided conclusive evidence that affected members of one flock were suffering with a vitamin A deficiency. Oats grain is extremely low in vitamin A content. Individual birds on free choice grains and commercial supplement could possibly develop a conjunctivitis due to a vitamin A deficiency resulting from the eating of an excessive amount of oats grain or vitamin A deficient ground corn.

A keratoconjunctivitis exists in turkey breeding flocks during the colder months of the year, the cause of which remains unsolved. Liver storage of vitamin A is lower in affected than in normal birds. The incidence of the disease appears to be related to an environment provided by cold, windy weather and the lack of protection from the elements. The similarity of the disease to hyperkeratosis in cattle has been suggested.

Acknowledgments

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Dr. Dale Richey of the South Carolina Agricultural Experiment Station provided the avian isolates of PPLO and cooperated by conducting PPLO hemagglutination tests. Molds isolated in connection with this investigation were identified through the courtesy of Dr. H. L. Chute of the University of Maine. Mrs. Carolyn Jacobs assisted in the preparation of the manuscript.

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Pasteurellosis in Man Now Recognized More Frequently

Human infection with *P. multocida* is being recognized more frequently. In a recent survey, K. F. Meyer reported on 108 cases, with five deaths. Bacteriologic confirmation was made in 88 of these. Until recently it was not appreciated that *P. multocida* is not infrequently (42 instances) demonstrable in the sputum of patients suffering from bronchiectasis. Animal bites were the precursors of infection in 35 cases: 27 cat bites, five dog bites, one rabbit bite and one panther bite. Exposure to cattle, pigs or rabbit carcasses (muscle in particular) or consumption of infected rabbits has brought on enteritis, conjunctivitis, blennorrhea, appendicular abscess, urinary infection and other manifestations. The generalized infections, symptoms of which vary widely from protracted, recurrent chills and fever to pneumonia and empyema (16 cases), meningitis and puerperal sepsis have been reported mainly from Europe. Before the advent of antimicrobial drugs generalized infections frequently proved fatal. The mechanism of infections leading to pleurisy, empyema and pneumonia remained undetermined. They are probably cryptogenic of respiratory origin. Most of the eight recorded cases of meningitis or brain abscess were sequels to skull fracture, sinusitis or mastoiditis. The offending organisms which induce meningitis after skull fracture come from the nasal passages. Sinusitis and persistent (up to six months) carrying of a Pasteurella in the nose of an animal caretaker or meningitis following plastic operation for an abscess on the nose attest to this conclusion. Particularly interesting is the fact that *P. multocida* apparently may lie dormant on the mucous membrane of the respiratory tree for months, and only after trauma or some physiologic disturbance of the infected tissues is an acute infection provoked. Localized infections on the hands, which may be limited to phlegmon, myositis and abscesses, are too often complicated by osteomyelitis.

The sera of patients tested in the course of subacute infections yielded agglutination or complement fixation titers in dilutions of as high as 1:3,200 with the Pasteurella isolated from the lesion. Allergic skin tests are claimed to be useful in differential diagnosis.

In 1957, human cases were reported in a number of states. One case in Connecticut was in a five-year-old girl who was bitten by a dog. The facial wound became infected. A greyish exudate was expressed from the laceration and from this *P. multocida* was isolated. This was the fifth identification of this organism in the Connecticut Health Department Laboratory. Clinical manifestation in two of these cases involved abscesses following cat bites. The other two were in elderly persons with long histories of pulmonary disease. *P. multocida* was isolated from the sputum of both of these cases. Minnesota has reported five laboratory confirmed cases since 1954.

WHAT HAPPENS

When You and the Income Tax Collector

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RECENTLY we looked at the problems of John Brown, D.V.M., when his federal income tax return was checked by the Internal Revenue Service. In the large majority of such cases, taxpayers like Doctor Brown and the Internal Revenue Agent agree on what his corrected tax liability should be. In this article, however, we will take up what happens if you and the revenue agent can not agree about your tax return.

To take a specific example, suppose Dr. John Brown, Sr., a mature veterinarian, suffered a severe coronary attack in 1956, necessitating his hospitalization for several weeks. His physician told him bluntly that in the future he could not under any circumstances climb the stairs in his high-ceiling old-fashioned home. As a result, after consulting with an architect and builder, Doctor Brown had installed in his home a small electric elevator at a cost of $5,000. By using the elevator faithfully, despite its inconvenience, Doctor Brown has avoided another coronary attack, and is making steady progress, but he still can not climb the stairs.

Doctor Brown deducted the cost of the elevator in 1956 as a medical expense. "The cost of this elevator," he explains to the agent in 1958, "is an expense incurred for the cure or prevention of disease, no different from the cost of a wheel chair or a set of crutches."

"Not so," replies the revenue agent. "It is a permanent capital improvement to your home and not a deductible medical expense."

"Nonsense," contends the doctor, "The elevator is slow and small and adds nothing whatever to the value of the house."

"I'm sorry," says the agent, "I can't agree with you, and I'm going to assess an additional tax of $1,500. on the disallowance of this deduction."

What does Doctor Brown do now? First and foremost, he should realize that the revenue agent's word is not the final one. His determination is subject to several stages of review all the way up to the Supreme Court of the United States, and a taxpayer never has to agree with him "or else."

Professional Assistance

If Doctor Brown was not represented by an attorney or accountant at the original audit, as many taxpayers are not, he should now obtain competent professional assistance, that is an attorney or certified public accountant who engages in tax practice.

What will be the cost of such professional assistance? An accountant or an attorney, like a veterinarian, ordinarily bases his charges on such factors as time, responsibility, and the difficulty of the problems involved, together with his standing in his profession. Some tax fees are contingent, based on, say, one third of the proposed additional amount of tax, if the case is won, but this is by no means universal. In all events, just as you encourage your clients to discuss the question of fees freely and openly with you, you should do the same with your tax advisor. And sometimes, of course, in cases involving significantly less money than Doctor Brown's, taxpayers conclude that by the time they consider counsel

Do Not Agree

fees and the value of their own time, the proposed tax liability isn't worth contesting after all.

Once you have engaged counsel, of course, he will carry the ball in dealing with the Internal Revenue Service, but there are still several decisions which you the taxpayer must make, always, however, with his advice.

There are two levels of review of the revenue agent's determination: (1) Within the Internal Revenue Service, and (2) in the courts.

Protest

In the Internal Revenue Service you first have an opportunity for an informal conference with another agent, of the same office known as a conferee. Such informal conferences are found to be particularly helpful where there has been, for one reason or another, a personality clash between the taxpayer and the agent, but otherwise the parties are not far apart. Beyond this informal level of review, is the Appellate Division of the Internal Revenue Service, which attempts to settle tax cases on a more formalized basis. Here the taxpayer presents his case in writing — called a "Protest."

Remember though that the Appellate Division still consists of employees of the Internal Revenue Service. They attempt to settle cases in a fair and reasonable manner, but they are in no way sworn like judges to decide cases impartially solely according to the law and facts presented.

Thus, although again large numbers of cases are in fact settled with the Internal Revenue Service at one of the levels of review there provided, Doctor Brown, the taxpayer, is still entitled to his day in court. In fact, he may choose any one of three courts in which to contest his tax liability.

First, he may choose an independent Court review in the Tax Court of the United States. The tax court's headquarters is at Washington, D. C., but for taxpayer's convenience its members hear cases at most of the larger cities in the country. The principal advantage of this court, which makes it the most popular with taxpayers, is that here a taxpayer may have his tax case reviewed *before* he has to pay the tax. However, if the court eventually rules agaist him, or the case is settled out of court, the taxpayer is liable for interest at 6% on any underpayment, running all the way from the time that his original tax return was filed, perhaps three to six years previously.

On the other hand, Doctor Brown can pay the tax asserted to be due by the government, again with interest running from the date of payment back to the date when the original return was filed. He may then sue the government to recover this payment in the District Court of the United States or the Court of Claims. Here, if he wins, interest runs at the same 6% on the amount which he paid, but this time in the doctor's favor. Which court to choose, of course, depends upon many other factors (for example, how long it will take to come to trial in each court) and the taxpayer must of necessity lean heavily upon professional advice.

The supercautious taxpayer can not start three cases, and then pick the one that seems to be going best. If statistics mean anything, the government does slightly better in the tax court and taxpayers in the District Court or the Court of Claims. In the case at hand, Doctor Brown chose to pay the tax and sue for a refund in the District Court mostly because his counsel found three nearly identical precedents decided in the doctor's favor in that court. And of course in any of these courts cases may be settled with the government at any time — frequently right on the courthouse steps.

Even the Tax Court, or the District Court or the Court of Claims, do not decide the case finally in all respects. The decisions of the Tax Court or the District Court are subject to review by the Courts of Appeal, of which there are 11 located on a regional basis throughout the country. And decisions of the Courts of Appeal, or the Court of Claims, are eventually reviewable by the Supreme Court of the United States. Needless to say, however, the chances of your tax controversy winding up in the Supreme Court are small. There were 93,160,000 tax returns filed in fiscal 1957. There were ten tax cases finally decided by the Supreme Court.

Nobody likes to pay taxes, of course, but at least there is some comfort in the realization that before you have to pay an additional penny in taxes beyond what you think you owe, you can be heard by an impartial and experienced judge. If you and the revenue agent can not agree, his word is not the law.

Florida Cattle Losses

An unusually severe Florida winter in 1957-58 prompted numerous erroneous reports that thousands of cattle were "freezing" to death on their winter pastures. During the early months of 1958, reports came out of the South of the most severe winter since 1856, a matter of 102 years, with resulting losses in cattle running into the thousands of animals. One survey of county agents in affected areas indicated that losses were in excess of 20,000 head, but not more than 30,000 head, or about ten to 12 times the normal winter loss. A less conservative estimate of animal losses placed the figure at 75,000 head. All evidence indicated that malnutrition was the most important factor in the beef cattle losses.

South Florida is flat country, but it has high and low places. During the summer the low places and the cypress heads are full of water, limiting grazing areas to the high ground. During the winter and late spring cattle normally feed in low places. During the winter of 1957-58, however, an abnormal amount of rain swamped the lowlands and flooded many of the so-called high places as well. Grass not covered with water was frozen to the roots. Cattle had nothing to eat and in many cases were marooned on little knolls where ranchers could not feed them. Even on improved pasture the damp cold killed the grass and constant rain ruined what roughage there was.

Ranchers in the Florida area do not normally depend on supplemental feeding, although experiment stations and progressive ranchers have been advocating and practicing supplemental feeding during winter months for some years. Important to these recommendations is recognition that protein supplement for at least part of the winter would improve reproductive performance. Thousands of ranchers, unprepared to put into effect supplemental feeding, watched their cattle die by the hundreds.

Many calves were born dead, or died within minutes after birth. Cows and calves starved to death or died of pneumonia and other anomalies occasioned by stress. It has been estimated that calf crops will be affected for years.

Many beef cattle lost weight ranging from 150 to 250 pounds. Brahmans and crossbreeds of Brahman blood took the winter as well as animals heavy on the British lines.

Shortly after Christmas, the government declared 11 South Florida counties disaster areas and shipped over 154 cars of Commodity Credit Corporation grain into the area. This grain was given out at 7 lb. per animal unit per day for 11 days. Later another issue of 7 lb. per animal unit per day for seven days was made available. Another issue was then offered to ranchers who signed what many considered to be a pauper's oath. There were few takers.

SMALL ANIMAL PRACTICE

How would YOU diagnose this?

CASE NO. 4 German Shepherd, Male "seeing eye" dog, 9 years old, developed lameness in left elbow. Patient's leg was swollen, edematous, and unable to bear weight. Lameness first observed ten days earlier.

What is *your* diagnosis? Radiographic study disclosed the nature of the ailment. For complete diagnosis and information about a dramatically successful new treatment for similar cases, see page indicated below.

turn to page LI

Early ambulation and reasonable costs characterize this procedure for repair of large long bones of cats. Use of Leighton Shuttle Pins is simple and satisfactory.

Use of Intramedullary Shuttle Pins in Cats

RUSSELL N. ABBOTT, D.V.M.
Rockland, Maine

REPAIR of long bone fractures of cats is becoming an increasingly important operation in a small animal practice. A few years ago, an owner would usually request euthanasia. Now the average client is interested in saving his pet, and is willing to pay a reasonable fee for this service.

External fixation of the femur or humerus by use of rigid bandage or the Thomas splint has not proved satisfactory in the feline patient. Difficulties in immobilization combined with elasticity of the skin and lack of muscular rigidity make good support of the injured bone virtually impossible. These apparatuses also tend to create adverse psychological effects in some patients.

The intramedullary pin has provided an improvement in feline fracture repair technic. This procedure assures the operator that fragments are in apposition and will stay that way. It also provides internal support for the injured leg and eliminates the need of external fixation.

Bone pinning with the Leighton Shuttle Pin (Kirschner) is a modification of the intramedullary pin, but provides three important advantages.

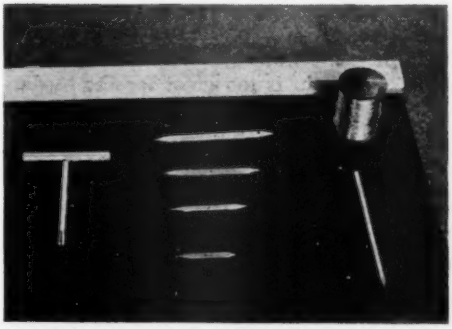


Fig. 1. The Leighton Kit includes intramedullary pins, reaming pins, wire, and a "T" shaped wire tightener.

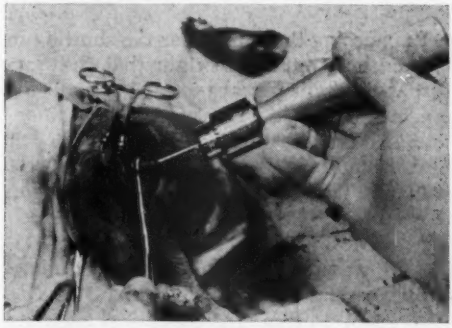


Fig. 2. Exposure of fragment ends. Remaining pin provides channel for shuttle pin.

1. The shuttle pin becomes a permanent part of the bone structure and is not removed.

2. There is no danger of joint involvement.

3. The pin does not project outside the bone or through the skin. This eliminates the danger of infection at the point of exit of the pin, and prevents injury to the bone by accidental manipulation of the projecting part. There is also no wound to heal since there is nothing to remove.

Even with these advantages, the shuttle pin is limited in use to fractures with fragments of sufficient length to accommodate at least one half the pin.

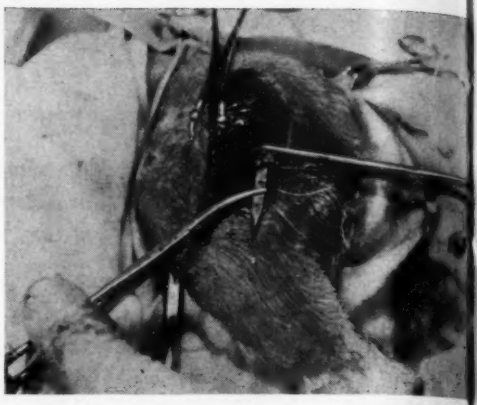


Fig. 3. Shuttle pin is inserted into proximal fragment and pushed into the fragment until pin is entirely contained in medullary canal.

The Shuttle Pin

The Leighton Shuttle Pin is manufactured of flat stainless steel, pointed on both ends, and provided with a small hole in the middle of the shaft. These pins are supplied in four sizes: 1 1/2 in. x 5/32 in.; 2 1/8 in. x 5/32 in.; 2 7/8 in. x 3/16 in.; and 3 1/2 in. x 3/16 in. Larger sizes are not used in feline work because the length and bulk of the pin is too great for the medullary canal. The remaining instruments in the Leighton Kit consist of two reaming pins, used to clean out the medullary canal prior to the insertion of the shuttle, and a "T" shaped stainless steel wire tightener containing a slit at the base of the tee. Cost of the complete kit is nominal. Pins are less than $3. A medium gauge stainless steel suture is also necessary.

Operative Technic

In choosing the subject for the shuttle pin technic, one must be certain that the fracture will permit passage for at least half the pin in each fragment. This can best be determined by measuring directly on an *x*-ray film. Should an *x*-ray be unavailable, direct palpation will usually reveal the location of the break. If any question arises regarding the accommodation of the shuttle pin, it is well to prepare regular intramedullary pinning apparatus.

It is of utmost importance that strict sterility be maintained. The pin kit, plus normal instruments used in any deep procedure should be autoclaved at 15 pound pressure for at least 15 minutes. No special instruments are necessary but, if available, bone hooks, retractors, and bone forceps will facilitate surgery. Sufficient shrouds, sponges, and suture material should also be prepared.

The entire leg of the cat is clipped with surgical clippers or shaved to well above the hip or scapula, scrubbed with Phisohex (Winthrop) and treated with a surgical antiseptic. The lone operator should prepare the entire leg so that should manipulation be necessary it can be accomplished with reasonable assurance of asepsis. If one works with an assistant, it might only be necessary to prepare the operative area.

The fracture site technic must be used in this operation. In all cases, the fracture should be approached from the lateral surface and the skin incised directly over the fracture line. Muscles are separated by blunt disection until fragments are reached. Blood clots and other debris are sponged or removed from the area. A review of anatomy will warn of vessels or nerves in the area. These should be protected during the operation.

Upon exposure of fragment ends, a reaming pin is inserted into the medullary canal of each to provide a channel for the shuttle pin; these are removed immediately. The

shuttle pin is prepared by passing a short stainless steel suture through the small hole in the shaft of the pin. The ends of the wire are tied together to form a loop about 1½ in. in diameter. The pin is inserted into the proximal fragment and pushed proximally until it is entirely contained in the medullary canal. The distal fragment is then brought into sufficient alignment to allow

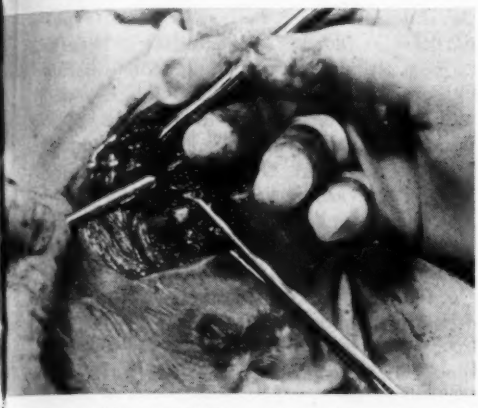


Fig. 4. With wire tightener, pin is drawn into distal fragment to one-half length of pin. Wire is then cut and removed.

the pin to enter. If the proximal fragment will not sufficiently accommodate the pin, this procedure may be reversed with no adverse effect. If neither fragment will completely accommodate the pin, which will occur occasionally if the longer pin is used, there is usually sufficient muscular relaxation and bone movement to permit the other fragment to be worked over the projecting end. When the angle of the break is acute, it is always wise to use the longer pin if possible. During this entire procedure, the wire loop must protrude from the fracture site.

Upon alignment of the fragments, grasp the wire loop directly below the knot with the wire tightener and wind the wire around the tightener. This action draws the pin into the distal fragment to one-half the length of the pin. Remove the tightener, cut the wire, and pull it out of the pin. If necessary, any minor alignment adjustments can be made prior to closing incision.

Rotation of the distal fragment during healing is not usually a problem. Muscle tone and swelling keep the bone firmly in place until a callus is formed. In most cases the cat is touching the paw to the floor in two or three days and is usually walking on the leg in a week. Skin sutures are removed on about the fifth day postoperative and the patient discharged. After care is seldom necessary.

Summary

A procedure of fracture repair using Leighton Shuttle Pins has provided a simple and satisfactory method of handling most fractures of the large long bones of cats. This method combines early ambulation and a reasonable cost.

Feral Nutria a Pest Problem

Enforcement of California state laws to prevent the escape of Nutria (see *Vet. Med.*, 52:293 [Jun] 1957), a large vegetarian fur bearing rodent, has been transferred to the State Department of Agriculture and County Agricultural Commissioners. Because the nutria is a vegetarian, it is in direct competition with migratory waterfowl for natural food in marshes. It damages levees and canals by burrowing, and is regarded as a pest in areas where it has returned to feral living.

Tissue Repair

An undernourished animal is always a poor surgical risk because of slow, or sometimes entirely nonexistant wound healing. Dogs, as an example, that have been fed for some time on a low protein ration are in this group. In order to build up wound reparative powers, research indicates that feeding on such proteins as soft boiled eggs, cottage cheese, animal and fish viscera, and red meat, are desirable foods for both dogs and cats.—*R. R. Dykstra, D.V.M.*

Feline Ovario-Hysterectomy

ALLEN WOLFF, B.S., D.V.M.

Alma, Michigan

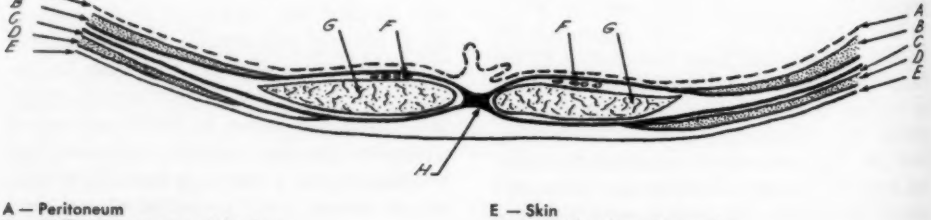
THE STANDARD midline abdominal incision is described by many authors. Apparently only a few describe the flank approach, however. In *Canine Medicine*,[6] a description of the ovario-hysterectomy (or panhysterectomy) to include the removal of the uterus and its adnexa is presented; the writers also describe a sutureless spay operation. Both procedures utilize a midline incision to expose the peritoneal cavity. Guard,[5] Sternfels, [10] and Schoenleber *et. al.*[11] describe only the abdominal midline approach through the skin, fascia, muscle and peritoneal layer, using a spay hook to catch the reproductive organs. The midline approach offers a *linea alba*, completely devoid of blood vessels. However, even the most experienced surgeon may sometimes venture lateral to the midline and encounter slight hemorrhage. The *linea alba* offers an almost bloodless operation as well as an easily sutured region, since there are only two rows of buried sutures with no muscle tissue to go through.

G. R. White[13] and Cecil French[4] propose both the flank (lateral) and belly (medial) incision, using general anesthesia.

O'Connor's description[9] consists of a vertical incision 3/8 in. long on a level with the anterior border of the ilium at the middle of the flank. The external oblique is picked up and punctured; the internal oblique is then brought through the wound and an opening made in it large enough to permit dressing forceps to be introduced into the abdomen. The ovary can then be located and secured and the uterus pulled into the wound, protruding omentum being replaced immediately. Procedure directs the surgeon to ligate and sever both ovaries (and uterus) and replace stumps into abdominal cavity; two no. 1 silk sutures are inserted into the internal oblique, one into the external oblique and two into skin. Healing is by first intention.

The French method as prescribed by Marcenac *et. al.*[8] utilizes preanesthetic sedation and novocaine infiltrated into the operative site; ether as general anesthesia is used only in "more important" and "difficult" cases. After the surgical field is prepared, an incision is made between the last rib and iliac angle in a downward and backward direction large enough to spread the wound margins for visual examination. Instruments only are introduced into the peritoneal cavity. Catgut ligatures control hemorrhage, excepting in young (six to eight months) where limited torsion is considered suffi-

Midline Caudal to the Umbilicus.



A — Peritoneum
B — Midline transuersus abdominus
C — Midline obliquus internus abdominus
D — Midline obliquus externus abdominus
E — Skin
F — Caudal epigastric vessels
G — Midline rectus abdominus
H — Linea alba

cient. Two rows of buried sutures join the muscular aponeurosis and skin sutures complete the union. A many-tailed bandage is used as a protective device.

When asked for his reasons in preferring the flank method of opening the abdominal cavity in cats over the ventral midline incision (almost universal in dogs), a small animal surgeon felt that the flank laparatomy obviated all the disadvantages of the midline approach. The abdominal ventral muscularis of the cat is thin and it is therefore difficult to cause strong union of wound edges in this region, the latter being highly essential to support the weight of the viscera. Additional strain on this region is due to the crouching attitude of the cat at rest[3].

Another small animal surgeon believes that the flank is as accessible as the midline field and presents no problem of ventral herniation; muscles are readily separable by blunt dissection. Since the surgical area is readily seen, the flank approach may not be as desirable cosmetically.

I have attempted both approaches to ovario-hysterectomy on the cat and the dog. It took more time to incise and dissect down to the abdominal cavity using the flank approach, but the organs were as readily located by either method. Although the flank method by some is considered acceptable only to ovariectomy, I was (with increased tension) able to draw the uterus, to and including the bifurcation, through the lateral wound to facilitate complete ovariohysterectomy. Suturing and postoperative care are deemed simpler by this method than by the median approach.

The route used may be decided by the experienced surgeon, after trying both approaches. Regardless of the site chosen, nothing can replace good surgical technic, asepsis, and the careful selection of the proper size suture material to facilitate proper healing of the surgical wound.

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Morris Animal Foundation Holds Research Conference

EIGHT OF THE COUNTRY'S young research scientists met in Denver July 7, 1958 to report at the first annual Research Conference of the Morris Animal Foundation on research projects they had conducted at various universities of the country.

Participating in the conference in Denver were members of the Advisory Board, (left to right) Dr. Charles W. Bower, Topeka, Kansas; Dean E. C. Stone, College of Veterinary Medicine, State College of Washington; Dr. George R. Cowgill, professor of nutrition, Yale University; and Dean William A. Hagan of New York State Veterinary College, Cornell University.

DDVP—A New Insecticide

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A POWERFUL AND VOLATILE INSECTICIDE called DDVP (Herkol—Norda Chemical) is a new dramatic concept of an insecticide assuming versatility in the veterinary field, that answers most of the problems confronting the veterinarian in the control of ectoparasites in the face of possible toxicity to hospital patients. The chemical name of DDVP is O,O, dimethyl-2,2 dichloro vinyl phosphate. When used as prescribed it evaporates in 15 to 25 minutes leaving no disagreeable odor.

DDVP has an acute toxicity no greater than some of the commonly used chlorinated insecticides and is considerably less toxic than the widely used organic phosphates TEPP (tetraethylpyro-phosphate) and parathion. Its toxicity is considered to be between parathion and malathion, similar to diazinon.

Controling Infestation

Its insecticidal spectrum is wide, including houseflies, fleas, lice, cigarette beetles, tobacco hornworms, cabbage looper, mad fly, gnats, and numerous other insects. The larvae of some of the insects are also destroyed with the use of DDVP. Of considerable interest is the fact that houseflies and mosquitoes resistant to DDT are killed by DDVP, and that so far no resistance to DDVP has been noted.

DDVP is volatile and leaves no detectable residue after several days. When incorporated into appropriate carriers or surfaces however, the residual activity can be significant for as long as two months. It is active in low concentrations and can be applied as an oil spray, mist, dust, wettable powder, emulsion or water solution, and as a fumigant. It is with the last that this report concerns itself.

I became interested in DDVP during the summer of 1957 when my animal hospital became infested with ticks. All insecticides failed to control this infestation and I consulted a friend who operates a successful exterminating company. We went over the area and discovered that ticks were everywhere, underneath the kennels, in all cracks and crawling over floors; everything from first stage ticks to large, engorged females were evident. He offered me a small amount of DDVP, an organic phosphate insecticide, which was showing good results under trial conditions. Using 2 mg. per cubic foot, I sprayed a room and kept it closed for six hours, first making certain that no animal could inhale fumes emanating from under the door.

At the end of the period the floor area was covered with dead ticks. Infestation was controlled by spraying one room daily and repeating in all rooms once a week for about three weeks.

Control of Ectoparasites

Possible use of DDVP on animals directly for the control of ectoparasites was next explored to cover the following points:

1. Use on dogs and toxicity.
2. Use on cats and toxicity.
3. Toxicity when used in enclosures with animals.
4. Use of chemical as spray when completely enclosed.
5. Possible methods of use.
6. Effectiveness of chemical as fumigant in open container.
7. Strength of solution.

As an arbitrary dilution, 1 oz. Herkol 50% W. E. per gallon of water was used. It was effective in almost all tests.

Technic for application on dogs involved the use of a sponge moistened with the solution and rubbed lightly with the grain of the hair, leaving the outer coat slightly moistened. The animal was returned to the kennel to remain in contact with fumes. No toxicity occurred and it was found that the fleas dropped off in from five to 20 minutes, depending on the length of the hair coat. The solution was effective against ticks after 30 minutes. Some fell off, but almost all remained and could be brushed off. No effect was evident on engorged females.

The solution was dispensed to a client who had seven cats all badly infested with fleas. The cats were maintained on the back porch where a large fly population was attracted by presence of food. The client duly reported that all fleas were killed with no evidence of toxicity to the cats, and fleas were not evident on the animals for about one week. It was also noted that flies continued to die from residual fumes.

Toxicity

To determine toxicity of DDVP when used on animals maintained in partially enclosed quarters, several surgical patients were returned to cages in which a sponge moistened with DDVP had been placed in one corner. The DDVP moistened sponge remained in the cage until the animal emerged from under anesthesia. Fleas dropped off in 20 minutes. The effect on ticks was nil.

To determine toxicity of vapors, two dogs and one cat were placed in a closed room with a concentration of 1½ mg. per cubic foot and allowed to remain for 18 hours. There was no evidence of toxicity.

Other Uses

To determine effectiveness of DDVP as a general fumigant, a ball of cotton soaked with the solution was attached to the wall of a fly infested room. The flies started dying almost immediately and continued for three days. Flies continued to enter this occupied kennel room through an open window.

Spraying DDVP into a closed room is 100% effective against fleas, flies, lice and ticks; this includes engorged female. Results can be attained in one hour, but four to six hours are recommended so that fumes can make as deep a penetration as possible in cracks around door jambs and wood. Herkol (1½ cc. of the 50% solution) dissolved in water and sprayed until spray containor is empty. The amount of water is incidental since the concentration is based on mg./cu. ft. This amount will cover 1,000 cubic feet.

As an example, a room 10 x 20 x 30 ft. has 6,000 cubic feet. Therefore 9 cc. of concentrate in enough water to spray the room will be 100% effective in four to six hours.

A small sprayer called a fog maker instead of a sponge has proved effective. The time required for spraying, as well as amount of insecticide used is thereby reduced.

The following are suggestions for possible use.

1. Use a high pressure fogger to spray cattle for ticks.
2. Fog a partially enclosed area to control lice on beef cattle.
3. Spray sheep for wool mites, and possibly for scabies.
4. Spray hen houses to control chicken mites.

Summary

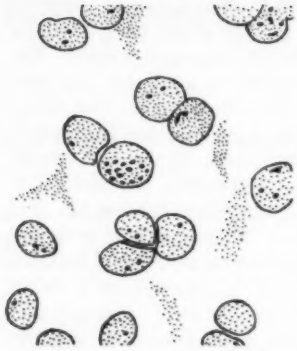
DDVP, a new insecticide, is a fumigant which makes a new approach to the control of ectoparasites on animals. It is simple in application, rapid in effect, economical in use, and effective.

National Dog Week Moves to Chicago

Chicago is again headquarters for National Dog Week, and Capt. Will Judy once more has taken over active direction of the movement he founded 31 years ago.

This development followed the dissolution on June 14, 1958 of the National Dog Welfare Guild, Inc. which since 1944 has sponsored National Dog Week out of its New York City office.

The new National Dog Week offices at 3323 Michigan Blvd., Chicago 16, Ill. are already at work on preparation of the necessary publicity and promotional material for the 1958 National Dog Week, which will be observed on September 21-27. Area and community chairmen are to be announced shortly.



Although research data and clinical observation leave much to conjecture, diagnosis of feline infectious anemia depends entirely on the isolation and identification of blood parasites. Parasitism, nutritional anemia, aplastic conditions, and other pathological processes must be differentiated for a definitive diagnosis.

Feline Infectious Anemia

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FELINE infectious anemia, a probable feline haemobartonellosis, was first described by Flint and Moss[1] as an infectious anemia of cats associated with "anaplasma-like" bodies on or attached to red blood cells. In their original article, these authors proposed the possible etiological agent to be either a haemobartonella or an eperythrozoon.

In a later discussion, Flint and McKelvie[2] described feline infectious anemia as an acute, subacute or chronic infectious disease of cats caused by a species of haemobartonella for which they proposed the name *Haemobartonella felis*. They contended the condition was widespread in the United States and cited observing 30 clinical cases in a two-year period. Flint and McKelvie concluded that the presence of the pleomorphic bodies on the red blood cells as observed on blood smears was pathognomonic of the disease. However, their absence could not preclude a positive diagnosis.

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Splitter *et. al.*[3] were able to produce the disease by intraperitoneal injection of pooled blood, from seven adult cats, into a splenectomized young cat. Subsequent inoculation of 28 susceptible cats provided the basis for their discussion on the various aspects of the infection. Splitter concludes that evidence obtained has indicated the agent of infectious anemia of cats persists in a carrier state in cat populations and that the blood parasite involved probably belongs to the genus Haemobartonella.

In their discussion of the family of Bartonellaceae, Peters and Wigand[4] question whether there is justification for two generic names, Haemobartonella and Eperythrozoon, on the basis of "trifling differences in morphology." A table of characteristics of these organisms along with those of *Bartonella bacilliformis* and photomicrographs, using both light and electron microscopes, are presented in this paper. Although much of their work revolves around *Haemobartonella muris* and *Eperythrozoon coccoides*, their discussion is based on the assumption that other species of these genera resemble

TABLE 1. Number of Days before the Appearance of the Bodies on Red Blood Cells and the Percentage of Positive Smears

	No. of days after inoculation (i.p.) before bodies appeared	No. of Blood smears examined	% Blood Smears positive for organism
Cat 1	15	23	56
Cat 2	69	23	8.7
Cat 4	Never appeared	4	0
Cat 5	12	24	29
Cat 9	2	10	20
Cat 10	14	11	36

H. muris and *E. coccoides* morphologically.

Case Reports. On Feb. 2, 1956, a nine-month-old male, domestic, shorthair cat was presented at the Small Animal Clinic of the University of Minnesota. The major complaint was that the animal had been depressed and anorexic for the last three or four days. The animal manifested periodic swallowing movements during this time and had always been inclined to chew and swallow household objects. Otherwise the present history was negative. The cat had been seen previously in September 1955 when was treated for panleukopenia and again in October 1955 for ear mites.

Physical examination revealed a depressed, slightly dehydrated animal in a fair state of nutrition. Temperature was 102.8 F., pulse 160/minute and weak, mucous membranes were extremely pale (paper white) and the spleen was significantly enlarged. No adenopathy or hepatomegaly was detectable. The mouth odor was foul and during examination hard feces were passed. The remainder of the examination was negative. A tentative diagnosis of feline infectious anemia and pharyngeal foreign body was made. Fecal and blood samples were sent to the clinical laboratory. Flouroscopic examination was negative. Laboratory work revealed a light coccidial (*Isospora felis*) infection and the following hemogram:

Hb. 3.8 gm./100ml.

Eosinophils	— 0%
Basophils	— 0

R.B.C. 2.2 x 10^6/mm.^{3}

Immatures	— 0
Juveniles	— 0

W.B.C. 11.3 x 10^3/mm.^{3}

Stabs	— 5
Segmenters	—27

Hematocrit 12%

Large Lymphs	— 0
Small Lymphs	—65
Monocytes	— 3

Mean corpuscular hemoglobin (M.C.H.)—17.

Mean corpuscular volume (M.C.V.)—54.

Eperythrozoon-like bodies were seen in large numbers; also 8 normoblasts/100 W.B.C.—1 plasma cell/100 W.B.C.

A diagnosis of feline infectious anemia and coccidiosis was made. The animal was immediately put on tetracycline; 40 mg. were administered intramuscularly that afternoon. The following morning, a blood smear revealed only occasional ring forms present. The animal's temperature was 103.8 F., pulse 200/minute, and in general appearance was brighter and more alert. The tom cat ate well. Only treatment given was 21 mg. of tetracycline intramuscularly twice daily.

Blood samples taken on Feb. 4, 6 and 8, were negative for eperythrozoon-like bodies. Hemoglobin rose sharply; on Feb. 6 it was 8.4 gm./100 ml. and on Feb. 8, 8.6 gm./100 ml. Erythrocyte count rose to 4.00 x 10^6/mm.^{3} on Feb. 4 and to 4.3 x 10^6/mm.^{3} on Feb. 8. During this time interval the following points were noted:

TABLE 2. Changes of Hemoglobin and Red Blood Cells from Level Demonstrated by Initial Hemogram to Lowest Level Reached During Period of Observation

	Reduction of red blood cells x 10^6/mm.^{3}		Reduction of hemoglobin gm./100 ml.	
	Initial	Lowest	Initial	Lowest
Cat 1	8.59	2.36	10.4	4.24
Cat 2	7.36	4.1	11.46	6.7
Cat 3	8.34	6.0	12.09	8.1
Cat 5	Report lost	5.0	Report lost	7.7
Cat 9	8.22	5.3	12.58	8.7
Cat 10	8.9	3.8	13.5	5.9

1. The only treatment given was 21 mg. of tetracycline intramuscularly, every 12 hours, and a single dose of feline distemper antiserum.

2. The cat was quite bright and alert, had a good to excellent appetite and eliminated normally.

3. Body temperature rose to a high of 105 F. and then gradually subsided to normal.

4. On February 7, the animal's color was approaching normal and the spleen was reduced in size.

The owners had been informed of the animal's condition and as much as we knew about the disease. On Feb. 8, the owners were advised that the patient had improved markedly though we had no idea of what would happen in the future (complete cure, exacerbations, carrier state or death). As a result of the owner's eagerness to keep the cat and our interest in following the course of the disease it was decided to discharge the patient. The owner was instructed to give 50 mg. of tetracycline every 12 hours, per os, for seven more days and to return to the clinic for follow-up examinations.

The cat was returned on Feb. 17, with the history that the patient had been playful and active but that appetite was finicky. Examination revealed ear mites and a temperature of 104.3 F. Fecal examination was negative and a blood smear revealed no eperythrozoon-like bodies. Canex (Merck) was dispensed for the parasitic otitis and the owner was requested to make a twice daily temperature record on the patient.

On Feb. 20, via the telephone, the owner reported that on the evening of the 17 the animal's temperature was 101 F. and that it had remained normal during the past two days. The cat was eating well and appeared to be normal.

On April 2, after missing two re-examinations, the owner was contacted by telephone again and said that the cat was doing well. She was requested to bring the animal to the clinic and on April 6, we had a chance to re-examine the patient. The cat had done well since the previous visit and nothing abnormal could be recorded in the history.

TABLE 3. Correlation of the Presence of the Bodies in Smears to Symptoms, Decreased Hemoglobin, Decreased Erythrocytes and Fever

	Symptoms	Fall in Hb.	Fall in R.B.C.	Fever
Cat 1	±	+	+	
Cat 2	—	+	+	—
Cat 4		Organism never demonstrated		
Cat 5	+	+	+	—
Cat 9	±	Only smears made		±
Cat 10	±	+	+	—

Examination likewise revealed no significant abnormalities. A blood sample was taken and revealed the following:

Hb. 13.3 gm./100 ml.
R.B.C. 9.8 x 10^6/mm.^{3}
W.B.C. 13.2 x 10^3/mm.^{3}
Hematocrit 37%
Platelets 10^3/mm.^{3}
M.C.H.—13.5
M.C.V.—37.7

Eosinophils	— 3%
Basophils	— 0
Immatures	— 0
Juveniles	— 1
Stabs	—10
Segmenters	—37
Large Lymphs	— 0
Small Lymphs	—49
Monocytes	— 0

No eperythrozoon-like bodies seen.

It is our hope to follow this case further by periodic blood work and examinations.

Case 2. On Nov. 1, 1954, a five-year-old, castrated male tabby cat (SB2502) was presented at the clinic with the complaint of depression, anorexia, and loss of weight. History revealed that the cat was allowed to run free and usually stayed away from home for long periods. A month prior to presentation the patient had received a penetrating skin wound while fighting another cat. The animal had never been outside the state of Minnesota. An ear mite infestation was the only previous illness.

Examination revealed lethargy, poor condition, and debility with weakness, loss of

weight, and shedding. Temperature was 104 F., pulse rapid, and breathing normal. Mucous membranes were pale and lymph glands normal. Otherwise, examination revealed no abnormalities.

The patient was entered into the hospital and supportive treatment and aqueous procaine penicillin were administered. Blood, urine, and fecal samples were collected for a hemogram, urinalysis, and parasitology studies respectively. The next day the temperature had dropped to 100.4 F. and pulse was 220/minute. The patient had urinated though it had not eaten or defecated but appeared somewhat brighter.

The C.B.C. revealed the following:

Hb. 3.91 gm./100 ml.
Eosinophils — 3%
Basophils — 0
R.B.C. 2.61 x 10^6/mm.^{3}
Immatures — 2
Juveniles — 9
W.B.C. 23.25 x 10^3/mm.^{3}
Stabs — 9
Segmenters —25
Hematocrit 16%
Large Lymphs —46
Small Lymphs — 0
Platelets 10^3/mm.^{3}
Monocytes — 6
M.C.H.—14.9
M.C.V.—61

Eperythrozoon-like bodies were seen on red blood cells; anisocytosis, polychromasia, 29 normoblasts/100 W.B.C.

Urinalysis was normal and the fecal specimen was negative for parasitic ova. A diagnosis of feline infectious anemia was made. Supportive treatment was repeated with the addition of streptomycin (5 mg./lb. body weight, b.i.d.) to the previously mentioned regimen.

The following day the temperature was 101.8 F., pulse 210/minute, and respiration normal. The cat had a normal bowel movement and had urinated. During an attempt to obtain another blood sample, the animal expired. Blood was immediately taken from the heart with the hope of transmitting the disease to other cats and thus follow the course of the disease under experimental conditions. A bone marrow study was completed and revealed the following:

Bone Marrow (SB 2502)

Examination of the concentrate smears revealed a marked normablastosis. Numerous mitotic figures were present in the normoblast series particularly in the polychromatic normoblasts.

Macrophages were seen to contain engulfed red blood cells with numerous eperythrozoon-like bodies.

Pronormoblasts	4
Basophilic normoblasts	5
Polychromatic normoblasts	51
Orthochromatic normoblasts	21
Myeloblasts	3
Neutrophil promyelocytes and myelocytes	6
Neutrophil metamyelocytes	3
Stabs	2
Segmenters	0
Macrophages	3
Lymphocytes	2
Basophils	0
Eosinophils	0

The necropsy report was as follows:

Clinical History: Eperythrozoonosis.

External Appearance: There were no lesions involving the intestinal tract. The intestinal tract was devoid of food, and feces mixed with a mass of hair was noted in the rectum. The liver was yellow and mottled and rather friable. The spleen about two to three times normal size.

Genito-urinary System: Apparently normal.

Respiratory System: The ribs of the thoracic cavity did not break but bend. The lungs were slightly congested.

Cardiovascular System: The heart musculature was pale and somewhat friable. There was a clot in the pericardial sac where the cat was bled.

Central Nervous System: Negative.

Histopathology: Liver, spleen, and kidney were negative. Intestine, lymph tissue hypertrophied and mucus cells increased in numbers.

Lung: Several small lesions containing chronic inflammatory cells.

Diagnosis: None made.

Experimental Study

Six adult cats were obtained from the University of Minnesota's Experimental Animal Department at various periods for the purpose of reproducing the disease experimentally. Cats number 1, 2, 4 and 5 were injected intraperitoneally with 2 ml. of blood from SB 2502. Cats number 7 and 9 likewise received 2 ml. of blood intraperitoneally but from cat 5 (blood being taken after death). All cats were in varying degrees of health (fair to good) as determined by admission clinical examinations. All were parasitized and all received feline distemper antiserum on admission. During their stay at the University Veterinary Hospital they received treatment for all abnormalities other than feline infectious anemia. Daily temperature, pulse, respiration, feedings, defecation, and urination were recorded and complete blood counts were made every two to seven days. There were two daily feedings of canned dog food. Each cat was individually caged in a ward normally occupied by dogs and during the course of observation there was no contact with each other or other animals. Senior and junior veterinary students in the Small Animal Division had the responsibility, for the most part, of caring for and observing the animals and the authors are indebted to them for their assistance.

To shorten this report and to facilitate its interpretation, only one clinical record will be presented.

Cat 1. Initial clinical examination revealed no abnormalities. A fecal examination was positive for ascariasis and a complete blood count on the day of inoculation revealed the following:

Hb. 10.41 gm./100ml.
Eosinophils — 7%
Basophils — 0
R.B.C. 8.59 x 10^6/mm.^{3}
Immatures — 0
Juveniles — 3
W.B.C. 15.2 x 10^3/mm.^{3}
Stabs —13
Segmenters —45
Hematocrit 34%
Large Lymphs —32
Small Lymphs — 0
Platelets 10^3
Monocytes — 0
M.C.H.—12.1
M.C.V.—39.5

Two ml. of blood from SB 2502 were injected intraperitoneally on Nov. 4, 1954.

Findings are summarized in the clinical record (table 4).

Discussion

Although, in retrospect, this work leaves much to be desired and is lacking in completeness of certain detail, there are a few probable conclusions or thoughts that one might derive from it. If nothing else, the apparent need for additional information becomes quite evident. The definition of the reservoir, mode of transmission, portal of entry and escape, and determination of carrier state and other possible hosts are all factors which must be determined sooner or later.

In regards to a definitive diagnosis, it depends entirely upon the isolation or identification of the organism in the blood. This in itself presents difficulties because of the fact that many blood smears can be expected to be negative from animals which have the disease.[2,3] Thus, more than one blood smear might be necessary to demonstrate the agent. Early or immediate antibiotic therapy preceding blood examinations might clear the blood of the organism and thereby make a definitive diagnosis more difficult. In a differential diagnosis one must consider parasitism, nutritional deficiency and aplastic conditions, to mention a few.

There is nothing specific about the symtomatology. All signs of the disease are attributable to anemia and, therefore, in themselves make an etiological diagnosis impossible. It is fortunate and unfortunate that tetracycline may prove to be a specific therapeutic agent for this disease. It is easily conceivable that one might be tempt-

TABLE 4. Clinical Record

Date	R.B.C.	Hb.	W.B.C.	Hemato-crit %	Sed. ½ hr.	Rate 1 hr.	Temp. (F.)	Pulse /min.	Resp. /min.	Remarks
11/12/54	9.4	12.2	12.7	QNS	QNS		101.4	N	N	Bright, alert. Dusted for fleas.
11/19/54	4.6	7.4	12.7	QNS	QNS		102.4	N	N	Eperythrozoon-like bodies observed on R.B.C's. Active and alert.
11/22/54	8.3	10.6	12.4	QNS	QNS		101.4	N	N	Eperythrozoon-like bodies observed on R.B.C's. Slight anisocytosis and polychromasia. Active and alert. Color good.
11/29/54	4.5	6.3	11.2	21	71	74	102	N	N	Eperythrozoon-like bodies observed. Slight anisocytosis and polychromasia. Depressed.
11/30/54	2.76	4.55	10.5	QNS	QNS		103	N	N	As previous day.
12/ 1/54	2.86	5.21	12.0	18	75	77	102.2	N	N	No eperythrozoon-like bodies observed Moderate anisocytosis, marked polychromasia. Howell-Jolly bodies. 11 normoblasts/100 cells. Depressed.
12/ 3/54	2.36	4.24	10.5	13	78	81	100.9	N	N	Eperythrozoon-like bodies observed Marked anisocytosis and polychromasis. Howell-Jolly bodies. 10 normoblasts/100 cells. Depressed.
12/ 6/54	2.86	5.21	12	18	75	77	102	N	N	No eperythrozoon-like bodies observed Moderate anisocytosis and polychromasia. Depressed, poor appetite.
12/21/54	3.8	6.57	8.5	20	69	72	101	N	N	Eperythrozoon-like bodies observed. Anisocytosis and polychromasia. Many basket cells and 2 normoblasts/100 cells. Howell-Jolly bodies.
12/24/54	4.02	7	8.6	22	25	67	100.8	N	N	Few R.B.C.'s show eperythrozoon-like bodies. Alert and active.
1/11/55	5.74		9.3	29	40	52	102.4	N	N	No eperythrozoon-like bodies observed.
1/18/55	6.99	10.4	16.75	QNS	QNS		102	N	N	Occasional eperythrozoon-like bodies observed. Alert and active. Had a coughing spell while being examined.
1/24/55	7.44	11.5	25.25	35	50	57	101.2	N	N	Occasional eperythrozoon-like bodies observed. Active and alert.
2/ 2/55	8.5	12.5	25.35	34	40	57	101	N	N	No eperythrozoon-like bodies observed. Active and alert.
2/ 8/55	9.5	12.5	26.45	37	15	45	100	N	N	Active and alert. Euthanasia.

R.B.C.— x 10^6/mm.^{3} Sed. rate—mm./½ hr. 1 hr. N—Normal Hb.—gm./100 ml.
W.B.C.— x 10^3/mm.^{3} Temp.—F. QNS—Quantity not sufficient

ed to treat any anemia with this antibiotic before doing diagnostic work and thus not be able to make a definite diagnosis. Although the drug apparently has significant therapeutic value, it is not known at this time what the final effect of tetracycline will be. The question arises as to whether or not a carrier state may develop with therapy or whether or not recidivations will occur. It is equally evident that therapeutic results cannot be judged on only one case and, therefore, all should seek further information.

The fact that jaundice only appeared in one case and at only one time is of interest. There is no question that the anemia is of a hemolytic type and it quite naturally follows that one might expect jaundice. The fact that it does not develop could be explained in the following way: That the rate of blood destruction is less than the capacity of the liver to excrete the products of decomposition or disintegration of the red blood cells. (Determination of blood bilirubin levels in the cases presented would have greatly facilitated this conclusion). Thus the rate of red blood cell distruction and the integrity of the liver are the determining factors regarding jaundice.

It also appears that animals may have the ability to meet the stress of the infection. This is indicated by the fact that blood values, in many cases, tended to return to normal without therapy. Further, this compensation is evidenced by the hyperplastic condition of the bone marrow reported previously.

One also questions the true cause of death of these animals. It is possible that an anemia in itself, if severe enough, could cause death through the disturbances of hemodynamics, et cetera. However, it would appear just as likely that the loss or decrease in body resistance might predispose the animal to secondary infection which ultimately would lead to death. Some physical stress superimposed on the anemia likewise might take the animal's life.

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Modern Zoo Feeding Practices

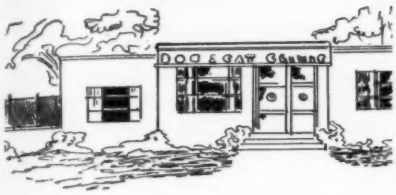
Although there have been few specific research-backed feeding recommendations for zoological animals presented in the literature, individual curators have taken far reaching steps toward adapting existing livestock and poultry rations to captive wild animals. The tinge to modern zoo keeping, accordingly, has been a side departure from traditional old German animal trainer's diets.

Zoological organizations at one time extolled the merit of feeding care given specimens. In recent years the addition of vitamins, trace minerals, antibiotics, et cetera, to feeds for domestic animals has moved the science far ahead of the level of feeding practiced in most zoos, however. Adaptation of newer feeding practices has been calculated to bring zoo feeding in harmony with the state of the nutrition art in domestic animals.

Much can be learned from wild animals which might be useful in the solution of nutritive problems of domestic livestock. Some steps have been taken in uncovering new facets of knowledge in this realm by the Ralston Purina Company, but these studies have proceeded more or less on the basis of field observations, rather than controlled scientific studies.

Complete data on all nutrition of common zoo specimens are available from the Ralston Purina Co., St. Louis, Mo.

CLINIC



CLIFFORD L. McGINNIS, D.V.M.
Peoria, Illinois

Cesarean Section

We have done quite a number of cesarean section operations on Beagles in the last four or five years. I'm not certain whether it is because there are more Beagles or whether the breeders are squashing them into too compact a ball. It seems that Beagle pups are bigger in circumference and shorter in length, and this then presents a difficulty when the mother tries to squeeze them through the pelvic canal. I can remember when the Boston Terrier was about the only breed we operated on routinely. Those who have a satisfactory technic for accomplishing a section operation may well shun this article. The end result is the payoff. To have a live bitch and live puppies to present to the owner is the ultimate goal.

Veterinarians who use ether anaethesia with good results should continue to do so. A successful method for suturing should not be changed. An after care program that keeps clients happy must be satisfactory.

I have tried to reduce the section operation to its simplest form in order to finish quickly.

General Procedure

First it must be established that surgery is indicated. Owners normally provide a history that the bitch has been in labor from four-to-six hours. Digital examination of the vagina and cervix will demonstrate that the fetus is in position to be delivered. There is usually a discharge. If thick and greenish, with no odor, the puppy is probably alive. If watery, green and malodorous, then at least one of the pups is dead. Next it must be determined whether the bitch is sick and toxic. Some owners will wait as long as two days to see if the bitch will not deliver normally.

I believe it is well to invite owners to stay and help massage and dry puppies as they arrive. Some clients get a little green around the gills, but they soon get interested, and it is good public relations to have them watch surgery.

Next we autoclave instruments and drapes. If a pack ready to go is available, it is much quicker, but I can not afford two sets of surgical instruments, so I prepare them as needed.

A bitch for which a section operation is indicated is seldom flighty or nervous because it has pretty well exhausted itself in the prewhelping furor and actual process of labor before being presented. With a no. 40 Oster blade we quickly shave the belly. Then I administer Demerol (Winthrop) subcutaneously, depending on size: 25 mg. for a Chihuahua; 50 mg. for a Beagle; 100 mg. for a Boxer.

Operative Technic

The bitch is then secured to the table in a dorsal position. I tell the owner that the bitch suffers more from lying on its back for 30 minutes than it does from the surgery. Next I scrub the belly with alcohol and paint it with tincture of Merthiolate (Eli Lilly). With a 20 gauge 1 in. needle, I infiltrate the median line with 2% procaine from anterior to the umbilicus, well back to the pelvic gridle; the skin is deadened first and then the muscle to the peritoneum. The tip of the needle can be felt as it approaches the peritoneum. I tip the table enough to allow the fluids to run off; by then the Demerol is taking effect on the bitch, but not the puppies. By the time I am ready to suture up the belly, the bitch is usually quiet. The patient is now ready to be draped.

Incision should be big enough so that the operator is not handicapped for room.

Do not forget the belly wall is thinned out considerably. The uterus is exposed. I do not try to fish it out of the abdomen in order to incise it. I prefer to incise one horn and run the incision back past the bifurcation so that both horns can be emptied through one incision. Puppies can now be removed, and unless they are dead, they come out fighting. The next step is to clamp off the cord and hand the pups to the owner and tell him to start rubbing to dry them. After that the placenta should be removed from the uterus slowly and carefully to avoid unnecessary hemorrhage: after exploring both horns to be sure they are empty, suture the uterus with double O cat gut. Begin at the posterior end of the incision, and with a Lembert type continuous suture catching the serous surface on each side, turn it in with the single row and tie off at the end; now suture peritoneum, muscle and fascia with interrupted O chromic cat gut suture. To speed up suturing, place this row as you would with a continuous suture and then tie each loop beginning from the front and working back. Use Vetafil for the skin in a continuous suture and remove it in ten days. Untie the patient and roll it over on its sternum for a few moments. Wipe as clean as possible and send it and the owner on the way, rejoicing.

By the time your client arrives home, the mother is caring for her puppies and pups will nurse and need no further care. I have described the normal healthy bitch and most of them will fall into this category. The exceptions are the Chihuahua that may die from shock as long as 24 hours after surgery and the bitch with the uterus full of dead pups. Both need postoperative supportive treatment.

Employer-Employee Relations

Last month we took a look at some of the advantages of employment in veterinary hospitals.

Let us now examine some of the marks of a good employee and some of the duties that are of great help when performed correctly.

1. Would your hospital attendants be willing to take any pet that is to be discharged into their own home, or are pets discharged soiled and smelly?

2. Is the reception room kept clean enough to preclude embarrassment when friends drop in to visit?

3. Within reason, do hospital attendents wear clean uniforms and keep personally groomed? An increased laundry bill for uniforms is one of the cheapest investment that can be made.

4. Do your employees know enough about drugs so that you can send them for more Nembutal, serum, vaccine, or whatever you require?

5. Do they constantly change soiled cages so an owner will never find his pet lying in filth?

6. After you have anesthesized a patient, can they place it on the operating table and prepare it for surgery?

7. Are treatment tables kept constantly refreshed with cotton, tape, swabs, drugs?

8. Doors, door jambs, baseboards, radiators, windows and walls all collect dust and finger marks. Do you have to tell your help to clean them, or will they do it automatically? Who polices the premises for paper and feces?

9. If the receptionist is busy, can one of the attendants greet a client and make him and his pet comfortable?

10. With a hospital full of dogs, you cannot personally supervise all the appetites, the eliminations, the scratchers, those that vomit and those that cough. Can your employees remember or write down all the pertinent facts about patients?

11. Who fixes things at your place. Do you, as the hospital director, have to tell some one to repair a break, or does one of your employees take care of it without having to be told?

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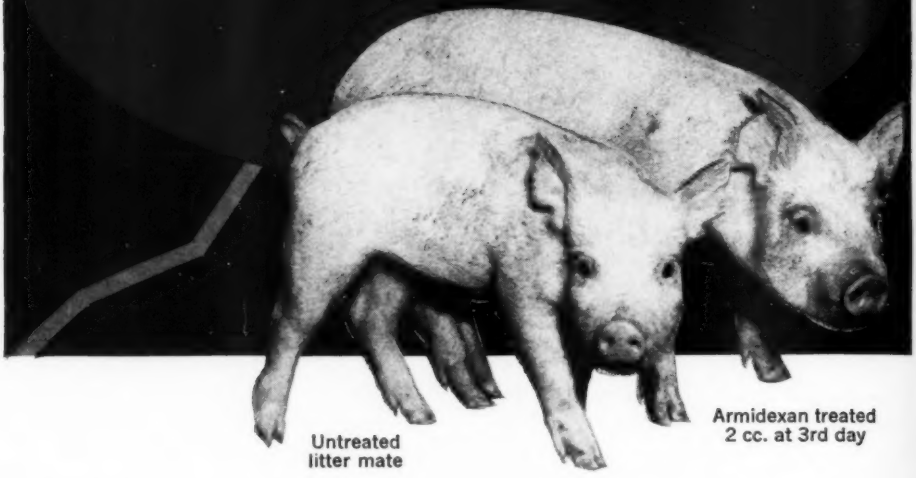

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Armidexan-treated pigs	**5 weeks**	**average 20.12 lbs.**
Untreated controls	**5 weeks**	**average 12.75 lbs.**

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A live IBR virus preparation assayed for pathogenicity in calves in undiluted form and titrated intramuscularly in the same species for immunogenic extinction met the criteria of an acceptable live virus vaccine. Carefully controlled experimental work is reported.

Infectious Bovine Rhinotracheitis (IBR)

III. Lack of Contact Transmission Following Intramuscular Inoculation

VICTOR J. CABASSO, Sc.D., and ROSS G. BROWN, D.V.M.

Pearl River, New York

PREVIOUS reports[1,2] have indicated that cultures of infectious bovine rhinotracheitis (IBR) virus capable of inducing a characteristic febrile response in susceptible cattle when applied intranasally, failed to cause any clinical reaction when injected by the intramuscular route. Neutralizing antibodies were formed following intramuscular inoculation, and animals so injected were found immune upon intranasal challenge. It was also suggested[2] that should infection fail to spread from intramuscularly inoculated animals to contact controls, as demonstrated both serologically and by actual challenge, there should be no serious objection to the use of this method for the immunization of cattle in the field.

This report presents proof that IBR infection is not transmitted to control animals following intramuscular injection of their intimate contacts. It also reports on immunogenic extinction of live IBR virus as determined by intramuscular titration in calves.

Viral and Rickettsial Section, Research Division and the Animal Industry Development Section, Farm and Home Division, American Cyanamid Co., Pearl River, N. Y.

Materials and Methods

Virus Strains. Details pertaining to the virus strains used in this study, to the tissue culture technics employed for virus cultivation, titration and serum-neutralization test, and to the intranasal exposure of experimental calves are as described previously.[3] Dilutions for titration and animal inoculation were routinely made in a sterile stabilizing medium.[5]

Experimental Animals. These were Hereford steers weighing from 400 to 600 lb. They were received at the laboratory six days before the start of the experiment from an area where IBR was not known to have occurred. During the preinoculation observation period, four animals with slightly elevated temperatures (calves 242, 237, 226, and 227) were treated intramuscularly with

1 gm. tetracycline per animal per day once, or for up to three days (see chart 1, parts 2 and 3). Treatment, however, was discontinued at least two days before virus inoculation and was not employed thereafter.

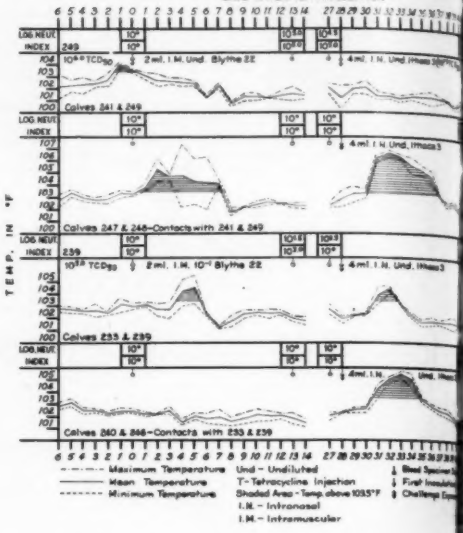
Nasal Washings. Each animal's nasal passages were flushed with 20 ml. of sterile stabilizing medium.[3] Washings were collected by drainage into sterile widemouthed glass jars, transferred into rubber-stopperred vials, frozen at once in dry ice-alcohol and held at -70 C. until tested. For virus assay, the nasal washings were thawed out and centrifuged at 4,000 r.p.m. for 30 minutes in an angle-head refrigerated centrifuge (International-Model PR-1). Individual supernates were treated with 100 units of penicillin and 100 micrograms of streptomycin per ml.; each was inoculated into two bovine embryo tissue culture tubes at the rate of 0.2 ml. per tube, and the balance was refrozen and held in the dry ice cabinet in case it would be needed for titration. Inoculated tubes were observed for cytopathology for a period of seven days.

Experimental Data

A virus preparation representing the 22nd passage of the Blythe strain of IBR in bovine kidney culture, having a TCD_{50} titer of $10^{-5.9}$/ 1 ml. was used to make ten-fold step dilutions ranging from undiluted fluid to 10^{-4} inclusive. These were each inoculated intramuscularly into two calves in 2 ml. amounts, pairs of animals thus receiving from 1,000,000 to 100 virus TCD_{50}. These calves were housed on an isolated farm, each homologous pair in an individual stall closed on four sides and separated from the next by 5-ft. high, 2-in. thick wooden partitions. With each injected pair were placed two uninoculated calves to serve as contact controls, eating and drinking from the same facilities. Attendants caring for these animals could enter the stall only by stepping into a galvanized iron pail, immersing their high rubber boots in a 5% cresol solution. They wore full-length aprons which they wiped thoroughly with the same disinfectant solution upon leaving one stall and before entering the next. During their daily rounds, they used separate thermometers in each stall, but not for each animal, and routinely proceeded from the animals inoculated with the highest dilutions to those which received the lowest.

Chart I

Febrile Response of Calves Inoculated Intramuscularly with Fol... Dilutions of Blythe Strain IBR Virus and of Contact Control An...



The undiluted virus preparation was administered intranasally to two additional calves in 4 ml. amounts (2,000,000 TCD_{50}). These animals were held on another farm, three miles from the first, and were cared for by different attendants.

The prechallenge observation period of all the animals was 28 days. During this time, daily temperature readings and observations for disease signs were made. Inoculated and contact control animals were bled on days 0, 13, and 27 for antibody studies, and nasal washings were obtained from all animals every other day until the day of challenge. The only exceptions were the two animals on farm no. 2, from which nasal washings were taken once on the seventh day after exposure.

Challenge of all animals, and one new challenge control, took place by intranasal exposure on the 28th day following inoculation. Each calf received 4 ml. undiluted fluid of 3rd passage Ithaca strain in bovine kidney culture (20,000,000 TCD_{50}). Daily

observations continued for 14 more days. An additional blood specimen was obtained on the 41st day and the animals were put off test the next day.

Results and Discussion

The daily temperature records and results of the serum neutralization test are given in chart I (parts 1, 2 and 3). For the sake of clarity, and as has been done previously,[3] temperature curves are given as mean, minimum and maximum for each pair of calves. It can be observed at the outset that several animals had temperatures above 103.5 F. for one or more days after

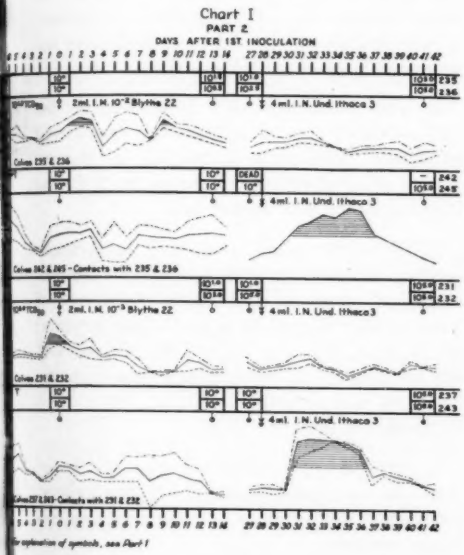


Chart I
PART 2
DAYS AFTER 1ST INOCULATION
2 ml. I.M. 10⁻² Blythe 22
4 ml. I.N. Und. Ithaca 3
Calves 235 & 236
DEAD
Calves 242 & 245 - Contacts with 235 & 236
2 ml. I.M. 10⁻³ Blythe 22
4 ml. I.N. Und. Ithaca 3
Calves 231 & 232
Calves 237 & 243 - Contacts with 231 & 232
For explanation of symbols, see Part 1

they were received here, or even on the first day of their arrival (calves 241, 249, 236, 242, 231, 237, 226 and 228). Moreover, some had elevated temperatures on the very day of intramuscular inoculation (calves 241, 249, 236 and 231). It soon became apparent, however, that the intramuscular administration of the virus did not aggravate the condition of these animals since temperatures returned to normal uneventfully in most calves (241, 249 and 236). The short fever bouts which followed inoculation in some animals (239, 235 and 236) are difficult to explain. They did not follow the IBR pattern and they took place in contact control animals. It is obvious that the febrile reactions of calves 237 and 248 were totally unrelated to IBR, since these animals were still devoid of neutralizing antibodies 20 days after their return to normal, and since they developed a classic form of experimental IBR after challenge. That a concurrent infection existed in many of these animals during the course of the experiment seems to be suggested by the fate of calf 242. As illustrated in chart I, part 2, this contact control animal had high temperature readings from the day it was received until the day it died (19 days after inoculation of its stall mates.) At autopsy, it presented a severe pneumonia which involved all lobes, with many abscesses from the size of a pea to that of a walnut. *Pasteurella multocida* was isolated in pure culture from lung abscesses.

Aside from the variations reported above, intramuscularly inoculated animals remained normal on the whole, as did their contact controls. Conversely, however, both intranasally exposed calves responded with a classic temperature response accompanied by the usual eye and nasal discharges.

Except for two specimens, all nasal washings examined were found negative for IBR virus. The two which readily yielded virus belonged to calves 228 and 229, exposed

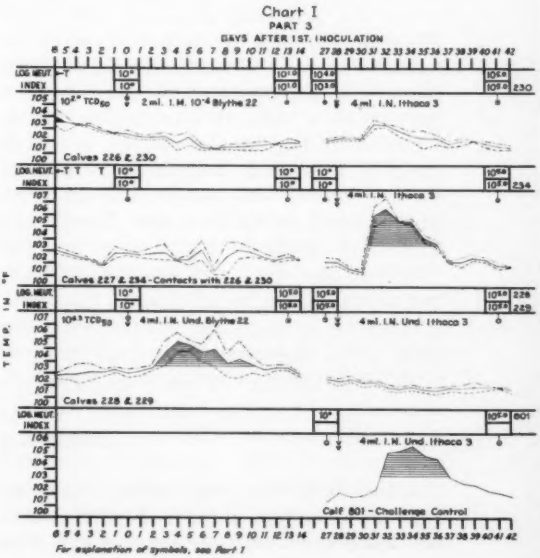


Chart I
PART 3
DAYS AFTER 1ST. INOCULATION
LOG. NEUT. INDEX
TEMP. IN °F
2 ml. I.M. 10⁻⁴ Blythe 22
4 ml. I.N. Ithaca 3
Calves 226 & 230
Calves 227 & 234 - Contacts with 226 & 230
4 ml. I.M. Und. Blythe 22
4 ml. I.N. Und. Ithaca 3
Calves 228 & 229
4 ml. I.N. Und. Ithaca 3
Calf 801 - Challenge Control
For explanation of symbols, see Part 1

intranasally and sampled on the 7th day only. Titration of these washings revealed rather appreciable virus contents: $10^{3.5}$/ml. for no. 228 and $10^{5.0}$/ml. for no. 229. The ease with which the virus was isolated from these two animals speaks in favor of the sensitivity of the test system which failed to demonstrate the presence of the infective agent in the 280 specimens tested from the intramuscularly inoculated calves.

The Serum-Neutralization Test

Results of the serum-neutralization test revealed that all animals employed possessed no IBR antibodies at the initiation of the experiment. It was somewhat unexpected to find that, regardless of the dilution received, all intramuscularly inoculated animals had developed serum neutralizing (SN) antibodies by the 14th day following injection. True, the level of these antibodies was highest with undiluted tissue culture fluid and followed a rather irregular pattern with subsequent dilutions. Furthermore, among the latter, 4 out of 8 animals had increased SN titer on the 27th day, and one maintained the same level; whereas in two, titers decreased somewhat, and one became negative. In contrast, all contact control calves were negative for SN antibodies up to the day preceding challenge, supporting proof of the lack of transmission of infection even at the subclinical level. This was amply substantiated by the results of the challenge. Animals receiving as little as 100 virus TCD_{50} intramuscularly, as well as those first exposed intranasally, remained normal, whereas all contact and the challenge control calves developed the disease. The brief thermal response of no. 233 (104.8 F. one day) and no. 239 (104.5 F. two days) cannot be adequately explained. particularly since at least one of these animals (233) possessed an appreciable level of SN antibodies at the time of challenge.

Summary

A live IBR virus preparation (22nd bovine tissue culture passage Blythe strain) was assayed for pathogenicity in calves in the undiluted form and titrated intramuscularly in the same species for immunogenic extinction. Susceptible controls were placed with the intramuscularly inoculated groups to determine whether contact infection took place following inoculation by that route. The following conclusions may be drawn from the results of this experiment.

Conclusions

1. Animals exposed intranasally with 2,000,000 virus TCD_{50} developed a classic experimental IBR infection. However, intramuscular administration of as many as 1,000,000 or as few as 100 TCD_{50} of the same virus strain failed to cause the disease in susceptible calves but rendered them immune to intranasal challenge.

2. The intramuscular injection of the virus seemed not to aggravate a concurrent condition, probably bacterial in nature, which affected several of the animals during the course of the experiment.

3. Infection failed to spread to intimate contact controls as proved by (1) the absence of virus in the nasal washings of inoculated and control animals over a period of 28 days, (2) the lack of development of SN antibodies in contact animals, and (3) the full susceptibility of the latter to a challenge exposure.

4. The above findings justify the belief that the virus employed meets the criteria for safety and potency of an acceptable live virus vaccine.

Acknowledgment: *The authors wish to express their appreciation to Miss R. Wallace for supplying the tissue cultures, to H. Klaver, R. Adamski and R. Johnson for able technical assistance, and to Mrs. B. Manoogian for assistance in the preparation of the manuscript.*

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Bovine infertility is known to be the result of many infectious and noninfectious processes. The author refers to four common causes that should be investigated when infertility is presented as a herd problem.

Infertility in Cattle

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STATISTICIANS claim bovine infertility costs American livestock growers over $300,000,000. annually.

Some of the most common conditions observed in the clinic of the Georgia University, School of Veterinary Medicine is the subject of this discussion.

Granular Vaginitis

A surprising number of cases of granular vaginitis are observed at any season. Practitioners are inclined to minimize seriousness of this infection on conception. Experience at the University of Kentucky based on records of 46,000 cows bred by artificial insemination revealed that 69% conceived on first service in the absence of granular vaginitis. Of animals mildly infected, 66% conceived, and of those severely infected only 58% conceived on first insemination. In other words, there was a 12% difference in conception rate between severely infected and normal breeding cows. Conception rate following natural service is lower than under conditions of artificial insemination.

In one herd of Guernseys examined recently, granular vaginitis was present in most of the calves at one to eight weeks of age. These calves were subsequently moved to an isolated farm. Lesions were identified in nearly all of them up to breeding age. Conception rate improved when the owner began artificial insemination, largely because semen was deposited beyond the seat of infection.

In assembled herds many new and virulent strains of the infections are brought in. With natural breeding a flare-up of acute vaginitis may occur. Acriflavine jelly (1%), vaginal insufflation with bismuth-formic iodide powder (BFI — Merck-Sharpe & Dohme) or Dairmol (Dalare) have been employed in our clinic. In one large Angus herd, infection was satisfactorily cleared up with Furacin (Eaton) suppositories. Sup-

Presented at the 40th annual meeting of the Southern Veterinary Medical Association, Roanoke, Va., Oct. 27-30, 1957.

positories, when deeply inserted, have proved useful especially in small heifers. Repeat treatment is seldom necessary.

Mixed Infections of the Uterus

Many cows are being treated in our clinics that have a history of several breedings without conception. We prefer to treat these animals while in estrum. It is not the best time to make a good examination, but in most cases the farmer has paid for insemination without results. Treatment during estrum and while the cervix is dilated is recommended especially when infusion technics are employed. If on examination the uterus appears normal, heat periods are regular, and the vaginal mucus is clear, we regard the situation as a low grade infection of the uterus. We prefer not to regard this situation as functional sterility.

Many of these cases are treated with 200,000 to 500,000 units of aqueous penicillin plus 1 gm. of streptomycin in 20 to 30 ml. of saline. This is injected with a plastic insemination tube. The farmer is advised to have the cow bred in 5 to 6 hours. Results are equal if the cow is bred first and then infused a few hours later, or even the next day, unless definite pathological signs indicate retreatment before breeding.

When infusing the uterus with a plastic insemination tube we prefer not to insert the tube too far into the uterus. There is danger of damage to uterine mucosa. Cows have been observed with localized swellings in the uterus that were probably caused by rough use of infusion tubes. Fluids can be diffused throughout the uterus by gentle massage.

A single examination can not be depended upon completely. If mucus reveals pus flakes, penicillin and streptomycin are administered and the patient is given 20 mg. of stilbestrol. Pituitrin (5 cc.) is injected 24 hours later and the cow held over for breeding at the next heat. We like to examine these cows repeatedly (two or three times) before breeding and massage the uterus and ovaries gently but thoroughly at each examination. The synergistic action of stilbestrol and pituitrin do a better job of contracting the uterus and eliminating pus than either one alone.

Cows brought to our clinic for treatment of infertility get about this routine in the absence of definite pathology: Hi-Amine (Pitman-Moore) 1 oz. daily in grain for 15 to 16 days. The uterus is massaged between heats and treated with antibiotics at estrum by uterine infusion. Breeding by artificial insemination is recommended.

Cystic Ovaries

Cystic ovaries are less frequently observed in our clinic than in more intense dairy sections. Low value of cows precludes the use of hormones to a large extent in our area. Where cysts are thin walled, they may be crushed mechanically, but this procedure often results in adhesions. If done too frequently ovaries become partially nonfunctional due to fibrosis. We have treated some cows with chorionic gonadotropin and a few with Vetrophin (Abbott) with good results. We do not recommend breeding at the first heat after treatment with chorionic gonadotropin.

The Breeding Bull

Herd problems of infertility may concern breeding males. Unless cows are furnished with fertile semen, conception cannot result. Any fertility check in a herd should include the bull or a check on the handling of artificial insemination procedures. Not too long ago we were requested to assist a practitioner in a herd of 200 milking cows in which 48 cows were bred artificially three times or more (some even seven or eight times) without conception. A new inseminator had been in the territory for about six months. He has been so anxious to get these cows settled he had started inseminating them twice at 12-hour intervals. On rectal examination only two or three cows revealed any palpable metritis. The trouble was finally found to be that semen had not been kept at proper temperature to maintain viability.

Continued on page 514

Editorial

AGRICULTURE and the MARK of SUBSIDY

The trends now shaping the American agricultural industry were discussed by Dean Earl L. Butz of the College of Agriculture, Purdue, before the United States Chamber of Commerce recently. Dean Butz is not only an educator in the field, but also a former assistant Secretary of Agriculture, and accordingly deserves full recognition in presenting his side of a flaming controversy.

Dean Butz recognized five fundamental characteristics of current agricultural adjustment. He noted that capital requirements for farming will continue to grow, that trends toward larger and fewer commercial farm units will continue, that management has become the key factor in successful farm operation, that the commercial farm will increasingly assume the characteristics of a manufacturing establishment, and that the countryside will be "rurbanized."

The first three premises are self-evident, and at least one of the last two is open to question and searching analysis. Between the five points that Butz believes are characteristic of current agricultural adjustment, there is considerable room for disagreement.

It is quite true that with changing technology, farm production has jumped to dizzy heights per man, but it must also be noted that at the same time farmer dependence on markets — in which to buy and sell — have also increased. Possibly because he was speaking before the Chamber of Commerce, Dean Butz made no mention of supports, parity, and limited himself to criticism of political pressure without pointing up the area of that pressure.

Despite the fact that some agricultural economists have a philosophical distaste for government intervention in private business, it is nevertheless a fact that farm income is not likely to be determined in the future by the free competitive market process. This country has definitely abandoned the free market for agricultural commodities in the sense that it existed through the 19th century and up until 1928. It is moot, indeed, to today's economists to say that this is "good" or "bad." It is a fact, and those involved in farm problems must deal in facts.

This has come about for several reasons. One example should suffice. A cut in grain prices of modest proportions has been calculated to put thousands of farmers out of business. One answer, obviously, is to let nature take her course, to do nothing, to let the "forces" of economics alone. Such a policy has absolutely no chance of being adopted.

The community is not willing to see the basic agricultural adjustment between demand and supply take place by means of bankruptcy, abandonment of farms, et cetera. Such a process of attrition would mean that the best brains, the most capable farm-

ers would leave farming even faster. It might mean that 50 years from now agriculture would fall far behind the rest of the economy in technical efficiency. Meanwhile, with a growing population, it is not unlikely that real food shortages would overtake us. Nor is the community willing to let integrated monopolies pick up the pieces.

The forces of economics and the forces of politics are not opposite sides in the battle of change, as Doctor Butz suggests. They are the same side of the same coin.

At the same time it must be understood that the abandoned free market necessarily invokes controls. It has been estimated that if income were assured farmers for, say, ten years, overall production would jump from 50 to 300%.

It is quite evident from the foregoing that agriculture can not possibly assume characteristics of a manufacturing enterprise because the key to income control will rest in the hands of the government, not in the hands of agricultural industrialists. It will be the government that controls production and moves to eliminate surpluses, not individual farmers or integrated operations.

The non-farm population will increasingly come to write farm laws. It is not unlikely that direction will be given the move to supplement farm income in a manner that precludes the community from paying twice — once as payments to farmer, and once in the market place, as is now the case with farm support and production control payments.

Nitrate Abortion

Some states in the Union are blessed or cursed with more than the average of marsh land. Blessed if peat is harvested, or mucky land is available for the culture of celery, et cetera; cursed when pregnant cattle — free from *Brucella abortus* or other forms of infection — abort when grazed on such areas. Incidence of bovine abortion in some of these areas is reported to be 75% or even higher. At the University of Wisconsin Experiment Station, research points rather strongly to high nitrate content in much of the vegetation growing on such soil, though conclusive research is not yet finished. Veterinarians have frequently found excessive nitrates harmful, notably in so called "oat-hay poisoning" (nitrate of potash, or saltpeter poisoning) of horses. Also so called "cornstalk poisoning" of cattle at times seems to be associated with the excessive consumption of vegetation rich in nitrates. In all of these complaints, removing the animals to pastures or forage free of nitrate products has controlled the trouble. In "nitrate" abortion — if this is finally demonstrated to be the cause — there is another factor in that muck lands are extensive in some states with a goodly percentage of valuable forage, and in these situations it has paid to use herbicides.

Veterinarians and Feed Men

In introducing a discussion by Dr. R. C. Klussendorf, secretary of the American Association of Veterinary Nutritionists, the editors of *Feed Bag* (May 1958) state:

"For many years, veterinarians and feed industry members frequently lined up as opponents on matters which should have had their mutual cooperation. Antagonism occurred where teamwork should have ruled. Fortunately in recent years much progress has been made towards break down of barriers which have tended to keep feed men and veterinarians apart.

"Some of this progress has been led by the feed industry and some by veterinary groups. One of the latter which has done a notable job is the American Association of Veterinary Nutritionists."

Veterinarians, particularly those in general practice, have a considerable stake in the continued successes of joint conferences in which members of the A.A.V.N. have taken a lead as representing the profession. A.A.V.N. membership now numbers 90 veterinarians. Requirements for membership is that applicants must be members of the A.V.M.A. in good standing and have a motivating interest in nutritional problems of livestock.

Animal Health

R. R. DYKSTRA, D.V.M.

Cell Growth in Artificial Media

A recent report (*Archives of Pathology*, April 1958) describes the successful growth of cells of the human heart and aorta in tissue culture. The cells employed in experiments were obtained from adult human hearts and aortas during surgical intervention on these organs. The culture medium consists in general of a mixture of 40% human blood serum, 20% chick embryo extract, plus a balanced salt solution. At the end of 18 months cells are still actively proliferating. The intention is to use these cells in a study of rheumatic fever and atherosclerosis.

Ringworm in Cattle

The morning's mail brought a request from a cattleman residing in a sparsely settled western area. He stated that he was just getting started again in the cattle business, and that several of the animals had asbestos-like scabs around the eyes and on the sides of the neck; undoubtedly ringworm. For many years our advice has been to thoroughly dry brush the affected spots—region of the eyes excluded in the following treatment—with a stiff bristled brush, and follow this with another vigorous brushing with green soap. (Tinctura Saponis Viridis) This should cleanse the areas reasonably thoroughly. When dry, the parts are again brushed vigorously with a solution consisting of biniodide of mercury, 1 gm. in 500 cc. of tincture of iodine. If necessary a second application of the mercury-iodine preparation may be applied, or even a third, at intervals of four days. For the eye region, care in handling involves protection of the ocular globes. Harsh handling is avoided. Careful brushing followed by the swab application of the iodine-mercury preparation is safe in the hands of the qualified veterinarian. It is most certainly imperative to place non-affected animals in pastures, corrals, et cetera, where there is no opportunity to contract the mold by rubbing on contaminated fence posts, trees or buildings. Until the previously affected animals are clinically free from all evidence of the condition they must not be permitted to mingle with the clean herd.

Biopsy Technic

In the selection of a tissue specimen for biopsy, disinfect the area with 70% alcohol. Never use colored antiseptics such as iodine or Merthiolate as these could mask a clear-cut pathological diagnosis because of interference with later straining agent. Neither may local anesthetics be injected into the tissue to be removed; rather place it into the periphery. Do not unnecessarily mutilate the specimen by grasping with tissue destroying forceps; a clean-cut specimen is best. Immediately after removal place the specimen in 10% formalin and forward to a pathologist with a history of the case, and the current clinical appearance of the lesion.

Herbicides Unlikely Livestock Poison

Herbicides, such as those recommended for weed control in pastures and crops, have rarely been known to cause fatal poisoning in livestock, in spite of some claims to the contrary. Dr. R. D. Radeleff, research veterinarian at the Kerrville, Tex. entomological research center, points out the fact that herbicides also limit palatability of treated plants. Danger lies in consumption of freshly treated forage, which can be avoided easily by removing livestock from treated area for one or two weeks. Investigations have also revealed that relatively massive doses of these compounds required to poison also limits dangers of their use.

Nutrition

MORRIS ERDHEIM, D.V.M.

Feed Additives Information

The practicing veterinarian now has available a handy reference guide on the various additives being used in commercial feeds. This appears in a separate section of the recently published 6th edition of *Veterinary Drug Encyclopedia and Therapeutic Index.*

This section is divided into three reference areas:

1. Feed Additives describes additives and how they are used.
2. Feed Additives Manufacturers' Directory lists the additives according to manufacturers.
3. Feed Additives Index lists additives according to use.

While the list of additives does not contain all of the drugs now in use, it has most of them. It is hoped that future issues of this publication will carry a more complete listing.

This project was undertaken by the Public Relations committee of the American Association of Veterinary Nutritionists working with the Veterinary Relations Committee of the Nutrition Council of the American Feed Manufacturers' Association. The joint group has helped guide this activity to this point.

Practitioners are coming in contact with medicated feeds to a much greater extent than previously, and therefore this handy reference guide should prove useful in everyday practice. It is imperative that they be familiar with the makeup of feeds (particularly with reference to medicament additives) being fed to animals in their care. To know what these animals are eating is essential for the practitioner who is trying to render a complete service to his client. That is why this Feed Additives section is so important to the practitioner.

Urinary Calculi in Mink

Veterinarians appear to be becoming increasingly more interested in mink practice. A number have asked about the problem of urinary calculi in mink. The condition is observed most frequently in pregnant and lactating females; sometimes in young kits. It occurs during the summer months, between the end of May and August.

The condition is not readily apparent. It does not cause a loss of appetite, and the mink are therefore in good flesh. Diagnosis is usually made on autopsy.

While the cause is unknown, some measures can be taken to prevent the development of the calculi. Stones are formed in alkaline urine. Reduction of the pH of the urine appears to be an effective control measure. This may be done by feeding ammonium chloride (1 gm. per head per day) or phosphoric acid, in feed grade (0.8% of the dry mix). Where calculi present a problem, either of the two acidifiers may be added to the feed starting May 1 and continuing through Sept. 15. Ranchers have reported favorable results from both of the above treatments.

Cattle Center Moves East

The cattlemen's west is fast fading from the scene, according to statistics from the National Cattlemen's Association. Western cattle states once accounted for 75% of the national total of beef cows, with the remaining 25% accounted for by states east of the Mississippi. Latest cattle census indicates that the west has only 60% of the beef cows, and eastern states have 40%. Between 1949 and 1956, beef cows increased 61% on a nationwide basis. But the increase during this period east of the Mississippi was twice the 61% national average and about 3½ times the 37% increase in the west.

Practitioner's Laboratory

W. L. SIPPEL, V.M.D., Ph.D.

Florida Livestock Board
Kissimmee, Florida

Specific Gravity of Blood and Plasma

A simple accurate method for determining the specific gravity of blood, plasma or serum is available in the copper sulfate test. The values furnished by this test give information useful in arriving at a diagnosis of cases in which blood specific gravity or plasma protein values are altered.

The test is helpful in gauging the administration of fluids to dehydrated patients, whether caused by disease, excessive diarrhea, vomiting or burns, as the specific gravity of both oxalated whole blood and plasma is high in dehydration. These values are also high in surgical, traumatic or anaphylactic shock. In large hemorrhages, as might occur internally as the result of an accident, the blood specific gravity will be low. Nephritis, with excessive loss of albumin in the urine, will usually be reflected in lowered plasma specific gravity. Other conditions lowering plasma specific gravity are malnutrition, certain vitamin deficiences, and diseases of the liver and digestive tract. As transudates and exudates contain less than 2 gm. of protein per 100 ml., Phillips' *et. al.* state the method is not applicable for differentiating these fluids. Other authors[5] indicate it is used for that purpose. Exudates have a specific gravity above 1.017 transudates below that figure.

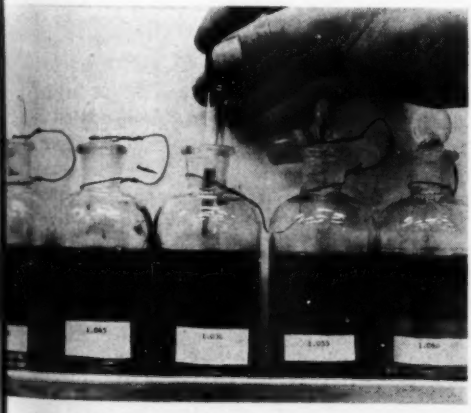

Fig. 1. Placing drop of blood in copper sulfate solution of specific gravity 1.050.

Reagents

Anticoagulant:

Ammonium oxalate	3 gm.
Potassium oxalate	2 gm.
Distilled water	250 ml.

Add 0.25 ml. to Bangs size tube and dry on sides in oven.

Copper sulfate solutions:

A series of copper sulfate solutions of gradually increasing specific gravity are used. Detailed instructions for preparation of these solutions can be found in several texts.[1,2,3,4] For those not having adequate chemical laboratory facilities, it is suggested that solutions be purchased from laboratory supply houses.[6]

Procedure

Blood (5.0 ml.) is obtained with a syringe (measured) and added to tubes prepared as above. This amount of blood provides 1 mg. of the oxalate solution per milliliter of blood, which will not alter the specific gravity. Oxalated blood should be used within a few hours.

The blood is mixed thoroughly by inverting the tube gently ten times. A drop of blood is allowed to fall into a copper sulfate solution from a distance of 1 cm. When the initial momentum of the drop is lost, it will either rise, if lighter, continue to fall, if heavier, or remain suspended for 10-20 seconds if of the same specific gravity

as the solution into which it was dropped. A sac of copper proteinate is formed around the drop as it enters the solution, causing it to remain discrete. After about 20 seconds, a precipitate is formed and the drop falls to the bottom. Thus the solution is self-cleaning. Copper sulfate solution (100 ml.) is good for about 100 tests.

The above procedure is repeated until the solution of equal specific gravity is found. If a complete set of solutions is not used, as is not necessary, one may estimate a value between the two solutions of closest specific gravity. The blood sample is then spun down, or the cells allowed to settle, and the procedure repeated with the plasma.

Fresh whole blood (used before clotting and serum obtained after it clots) may be used instead of oxalated blood and plasma.

The size of the drop used is not significant. The temperature difference between freshly drawn blood and the copper sulfate solutions at room temperature, causes only minor specific gravity changes. Blood from the refrigerator should be brought to near room temperature before use. The solutions should be kept in stoppered containers to prevent evaporation.

A nomogram has been established for humans by which it is possible to calculate accurately the hemoglobin and hematocrit values from the blood and plasma specific gravity values. This information is being compiled for animals by Dr. J. W. Needham at a Florida Livestock Board laboratory.

In limited experience with this test, it has been found low plasma specific gravity values in parasitized cattle and in a protein deficient hog are evident. Values in other conditions have been normal.

Wirth[6] gives the following values for specific gravity of blood and serum. Values for plasma are usually about 0.002 lower than those of serum.

	Blood	Serum
Horse	1.052	1.027
Cow	1.052	1.028
Dog	1.058	1.026
Cat	1.055	1.027
Swine	1.060	1.031

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2. Simmons, James S., Gentzkow, Cleon J., Laboratory Methods of the U. S. Army, 5th Edition. Lea & Febiger, Philadelphia, Pa., 1944.

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4. Hawk, Phillip B., Oser, Bernard L., Summerson, William H., Practical Physiological Chemistry, 13th Edition. The Blakiston Co., Inc. New York, 1954.

5. Available from E. Machlett & Son, 216 E. 23rd, New York, N. Y. or Fisher Scientific Co. 1458 N. Lamon Ave., Chicago, Ill.

6. Wirth D., *Grundlagen einer Klinischen Hamatologie der Haustiere*, 2nd Edition. Urban & Schwarzenberg, Vienna, 1950.

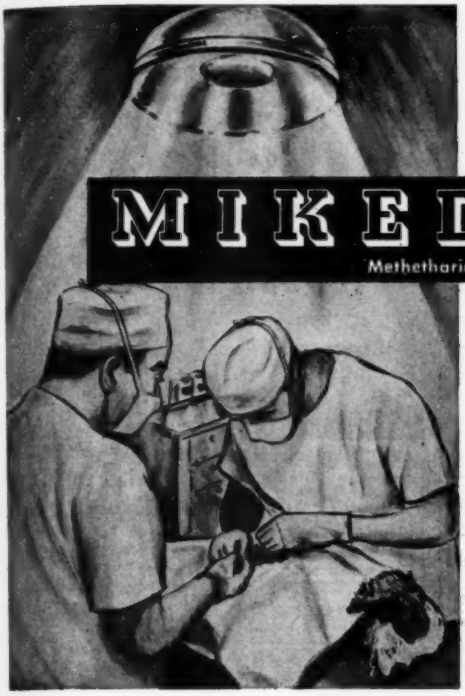
Infertility in Cattle

Continued from page 508

Bulls used on the farm for natural breeding do not get the thorough examination or care given bulls in artificial insemination barns. Here animals are given the best medical care to assure freedom from disease, including genital disorders that might influence conception rate. As an added precaution, semen is also treated with anti-infective agents.

Not many veterinarians are adept in the use of the artificial vagina. Our advice is to get one and know how to collect semen. Semen may be collected by electroejaculation procedures or from the vagina of a cow immediately after natural breeding. Microscopic examination for sperm vitality can be made on fresh mounts in the field; morphology study on stained mounts in the laboratory.

Bovine infertility offers a challenge to the practitioner. Application to specific problems and study of individual cases can be rewarding.



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Dr. Schulz joined the staff of Texas A. & M. as Director of Clinics for the School of Veterinary Medicine in 1956, and a year later was made head of the Department of Veterinary Medicine and Surgery.

Prior to joining the staff of Texas A. & M., he had been engaged in general practice in Jefferson City, Mo., for 18 years.

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Good News for Pot Pie Eaters

Television and radio audiences have been exposed to unreal words and pictures concerning the "chunks of white meat" in prepared and frozen chicken pot pies. This relatively new processed food product, unknown to mothers of today's veterinarians, has been enjoying increased popularity. Just what the modern housewife does with the time released for her use by having just to "pop it into the oven for five minutes" is not defined and remains unknown.

In any case, the California Department of Agriculture has come to the rescue of those who have searched in vain for evidence of chicken in pot pies by adoption of new standards for the product. Chicken pot pies shall hereafter contain at least 14% (1⅛ oz. per 8-oz. pie) of cooked deboned poultry meat. When prepared of raw meat, pies must contain a minimum of 25% (2 oz. per 8-oz. pie) of raw deboned chicken. Both percentages shall be exclusive of any skin, giblets, or fat which may be included in the product.

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Reader's Service

Ioclide (Clay-Adams) is a germicide which is lethal to highly resistant strains of Straphylococci aureus at present causing considerable trouble in human hospitals. Tests conducted by the manufacturer indicate that a dilution of Ioclide of 75 p.p.m. kills hemolytic *Staphyloccus aureus* freshly isolated from blood culture and resistant to penicillin, streptomycin and some broad-spectrum antibiotics. It is recommended for disinfection of cystoscopes, laryngeal mirrors, and surgeon's blades which do not tolerate steam sterilization. For more details ask Clay-Adams, 141 East 25th St., New York 10, N. Y.

Disposable Polyethylene Gloves designed for use by physicians and veterinarians to prevent cross contamination are cheaper than conventional gloves, according to manufacturer's claims. Gloves are made of thin, strong polyethylene providing good tactile sensitivity. Because they are powdered, gloves are easy to slip on. For details ask Emergency Kit Corp., 1841 Broadway, New York 23, N. Y.

Emergency Kit Corp.

Kem-Dip is a completely new dip now available for control of resistant brown dog ticks and fleas. The product is claimed to give positive control of brown dog ticks including engorged stages as well as other external parasites, and produces residual protection for approximately three weeks. For further information, contact Vet-Kem Laboratories, 10219 Denton Drive, Dallas, Texas.

A new line of **Seven Therapeutic Diets** for dogs and cats has been introduced by Formula Diets, Inc., 70-10 74th St., Middle Village 79, N. Y. Known as Lifespan Formula Diets, these foods will be sold only to or on prescription of graduate veterinarians through ethical veterinary jobbers.

Coordinate Plate and Film Comparator is described in new product bulletin 202-58, which is available on request from Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill. The plate and film comparator is designed for coordinate measurements on plates and films, and is useful for ultra-centrifuge and electrophoresis plates and films.

A new **Veterinary Products Catalog** containing information and prices on anesthesia equipment, oxygen therapy and resuscitative apparatus, medical gases, including other inhalation anesthetic agents and surgical needles is available free. Write Veterinary Products' Dept., Ohio Chemical & Surgical Equipment Co., 1400 East Washington Ave., Madison 10, Wisc.

A new **Telephone Index** that is firmly attached to the telephone dial at dial-level, and can be used for frequently used numbers, is available from Rest-A-Phone Co., P. O. Box 10544, Dallas 7, Texas. Write the manufacturer for details.

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Iowa State Honors Veterinarians

Nine veterinarians were among the men and women who were honored by Iowa State College Alumni Association at a centennial recognition luncheon, June 14.

Seven of the veterinarians were among the 100 who each received a centennial citation for having "made a unique contribution to the stature of Iowa State College." They are Dr. Burton J. Gray, ISC '43, president of Fort Dodge Laboratories, Inc.; Dr. Aaron H. Groth, Sr., ISC '21, dean of the School of Veterinary Medicine, University of Missouri; Dr. Earl A. Hewitt, ISC '18, professor of physiology and pharmacology, Division of Veterinary Medicine, Iowa State College; Dr. Charles Murray, ISC '10, dean emeritus, Division of Veterinary Medicine, Iowa State College; Dr. Harry L. Foust, OSU '14, technical advisor to Pakistan, Dacca, East Pakistan; Dr. M. Lois Calhoun, ISC '39, professor and head, Department of Veterinary Anatomy, College of Veterinary Medicine, Michigan State University; and Dr. Carl Olson, Jr., ISC '31, professor of veterinary science, University of Wisconsin.

An Iowa State College Alumni Merit Award was presented to Dr. Samuel H. McNutt, ISC '17, head of the Department of Veterinary Science, University of Wisconsin, "in recognition of pre-eminent service in advancing human welfare."

Dr. Ival A. Merchant, dean, Division of Veterinary Medicine, Iowa State College, received a faculty citation, awarded for long, outstanding and inspiring service on the College staff.

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SURGICAL KNIVES BY Rudolph Beaver

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Doctor Sholl Succumbs to Illness

Dr. Lloyd Banks Sholl, COR '23, died on July 14 in a Lansing, Mich. hospital after a brief illness. Doctor Sholl, professor of veterinary pathology at Michigan State University at the time of his illness, was to have retired in June 1959 after 35 years of distinguished service to the University. He was a frequent contributor to the veterinary literature in the area of clinical pathology.

Joins Atlas Canine Products

Dr. Seymour B. Bigman, MID '46, has joined the staff of Atlas Canine Products, Inc. as national sales manager. His activities in this new position will serve to broaden the scope of relationship between practitioners and research development of his company.

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David Cox Warns Producers Against Consumer Drug Promotion

A switch from ethical to consumer promotion is fraught with danger, David Cox, director of Ross Laboratories, told the Pharmaceutical Advertising Club at its April meeting in New York.

Citing the example of the baby solid food companies which left the area of ethical promotion and went directly to the public, Mr. Cox noted that they found themselves facing new competitive standards, higher selling costs, the need for new and novel products, a reduced profit ratio, competitive lawsuits unknown in the ethical field and increasing apathy on the part of physicians.

Extravagances in drug advertising brought about the creation of the Food and Drug Administration in 1906, he pointed out, adding that in the case of a minority of companies, "we have come a full cycle and it is time again to take the pledge."

Speaking of the human pharmaceutical

Continued on page XLIII

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10cc Procaine Penicillin — 400,000 Units with ½ gm. Dihydrostreptomycin in each 2 cc Aqueous Suspension	10 Vials	6.35
	100 Vials	58.00
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1 Vial — Penicillin G Powder — 500,000 Units each	10 Vials	1.60
	100 Vials	15.00
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10cc Dihydrostreptomycin Solution — ½ gm. per cc	10 Vials	6.25
	100 Vials	57.00
	1000 Vials	550.00
5gm. Dihydrostreptomycin Powder	10 Vials	6.25
	100 Vials	57.00
	1000 Vials	550.00
Tetracycline Capsules 250mg	100	22.49
	5x100	110.00
Penicillin Tablets — Soluble — 100,000 Units	100	1.45
	1000	12.00
	5000	53.00
Penicillin Tablets — Soluble — 200,000 Units	100	2.50
	1000	22.00
	5000	104.00
Penicillin with Triple Sulfas — 300,000 Units	100	4.95
	1000	47.50
Achromycin V Capsules 250mg — Lederle	100	27.50
5cc Acth-Gel — 40 units per cc Standard Brands	1 Vial	2.65
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	10 Vials	46.00
	100 Vials	440.00
Prednisone or Prednisolone — 5mg — Specify	100	6.50
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1	16	2.25	88
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1	124	2.00	80
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DAVID COX WARNS PRODUCERS

Continued from page XL

field, Mr. Cox pointed to a trend that may well apply to the field of veterinary medicine as well. "If the doctor's effectiveness continues to deteriorate, we will eventually see a great degree of our present freedom curtailed by policing agencies. Such agencies seem to extend their authority, and might well influence, through statute or publicity, our price and profit structure."

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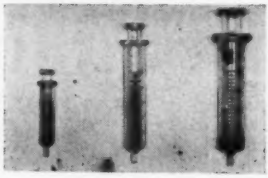

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Dr. Arthur Freeman (OSU '55) is editor. Mr. Ray Ottinger, advertising manager responsible for layout and design, took the bow at award ceremonies. The publication has been recognized two times previously during the past six years, both times receiving Awards of Excellence.

·VM·

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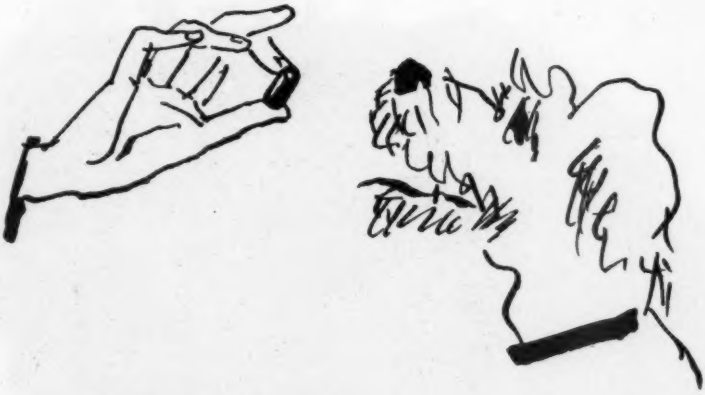

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1. Belloff, G. B.: Calif. Vet. 9:27 (Sept.-Oct.) 1956. 2. Mosier, J. E.: Vet. Med. 52:445 (Sept.) 1957.

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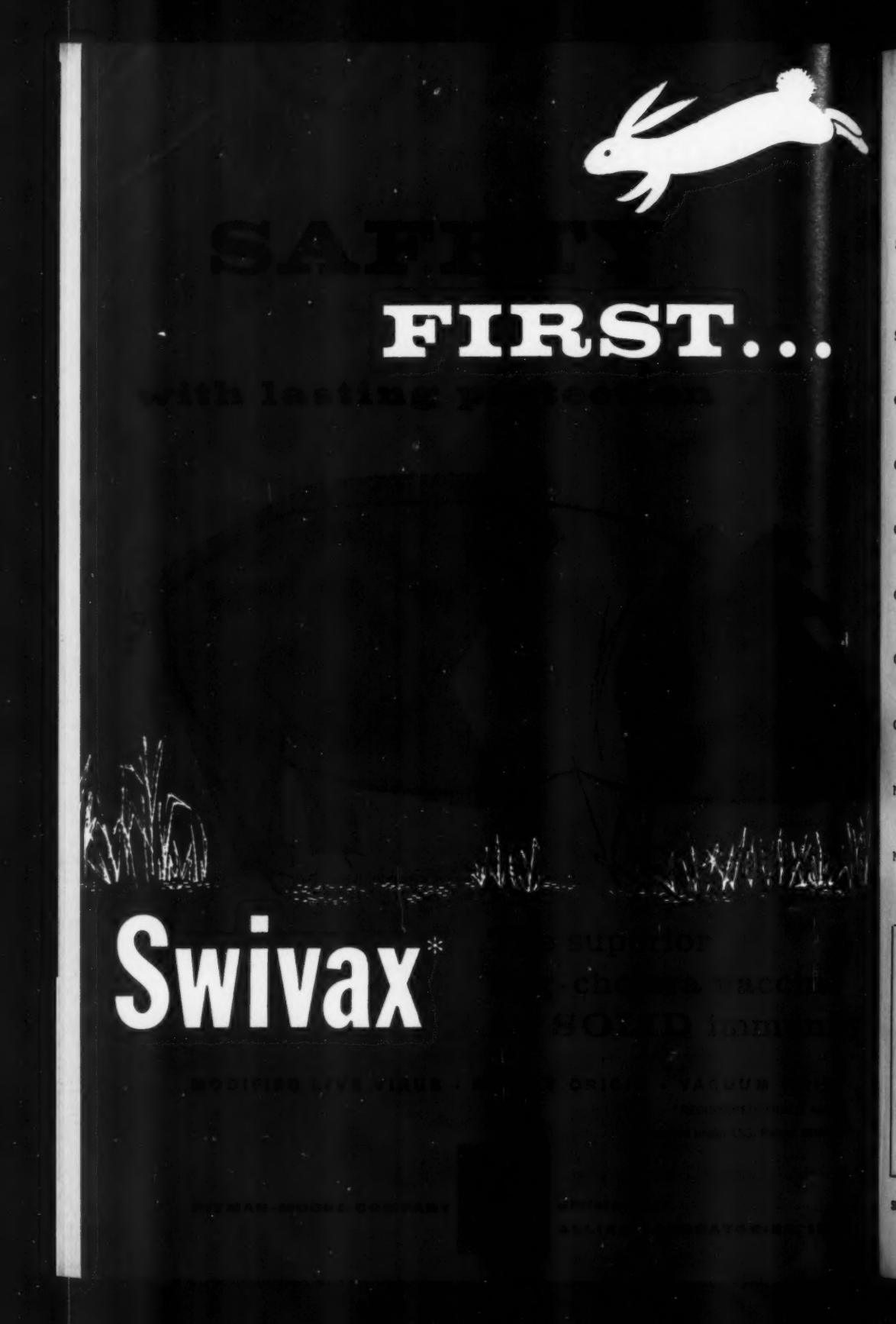
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Veterinary Calendar

Sep. 8- 9. **New Mexico Veterinary Medical Association,** annual meeting. La Pasoda Hotel, Santa Fe, New Mexico. Dr. E. R. Leslie, 920 N. Main, Carlsbad, New Mexico, secretary.

Sept. 22-23. **Georgia Coastal Plain Experiment Station,** 14th Annual Conference for Veterinarians. Georgia Coastal Plain Experiment Station, Animal Disease Department, Route 2, Tifton, Ga. Dr. Maurice W. Hale, Department of Animal Disease, University of Georgia, Tifton, Ga.

Sep. 28-Oct. 1. **New England Veterinary Medical Association,** Annual Meeting. Dr. C. Lawrence Blackely, 180 Longwood Avenue, Boston 15, Mass., secretary-treasurer.

Oct. 8- 9. **Purdue University,** 46th Annual Short Course for Veterinarians. Purdue University, Agricultural Experiment Station, Lafayette, Ind. Dr. L. M. Hutchings, chairman.

Oct. 6- 7. **University of Missouri,** 34th Annual Short Course for Graduate Veterinarians. School of Veterinary Medicine, University of Missouri, Columbia, Mo. Dr. Cecil Elder, chairman.

Oct. 11. **Iowa State College Veterinary Homecoming Luncheon,** (11:00 A.M.). Veterinary Courtyard, Iowa State College, Ames, Iowa. Robert H. Keith, publicity.

Oct. 12-14. **Florida State Veterinary Medical Association,** annual meeting. Galt Ocean Mile Hotel, Ft. Lauderdale, Florida. Dr. A. R. Chambers, 6116 Main St., Jacksonville, Fla., secretary.

Oct. 16-17. **Eastern Iowa Veterinary Medical Association,** Annual Meeting. Hotel Roosevelt, Cedar Rapids, Ia. Dr. F. E. Brutsman, Traer, Ia., secretary.

Oct. 26-29. **Southern Veterinary Medical Association.** Claridge Hotel, Memphis, Tennessee. Dr. A. A. Husman, Raleigh, North Carolina, secretary.

Nov. 4- 7. **United States Livestock Sanitary Association,** 62nd annual meeting. Hotel Deauville, Miami Beach, Florida. Dr. Ralph Hendershott, executive secretary.

Nov. 5- 6. **Mississippi Valley Veterinary Medical Association,** annual meeting. Pere Marquette Hotel, Peoria, Ill. Dr. W. P. Hendren, Carthage, Ill., secretary-treasurer.

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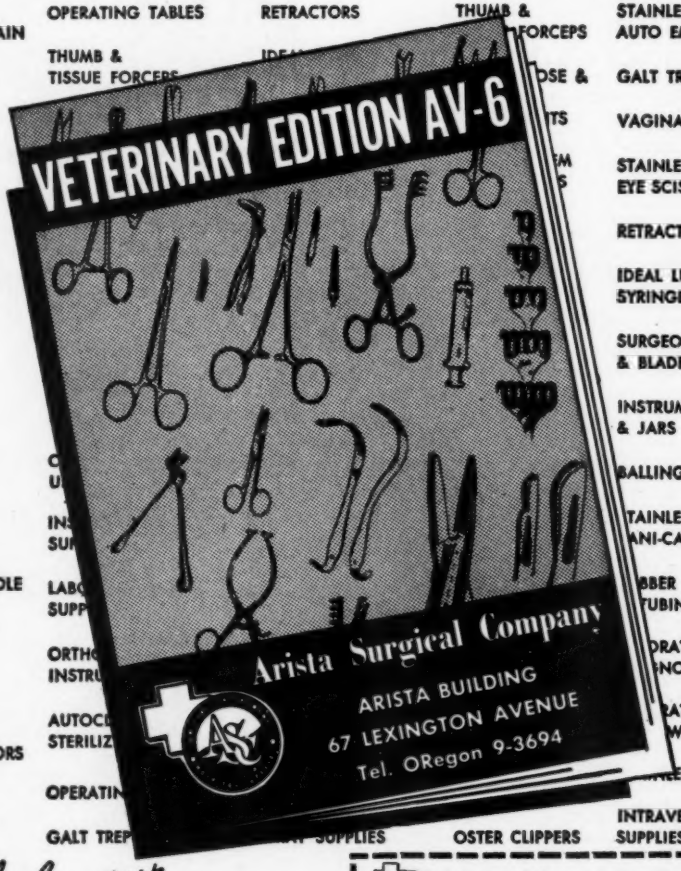

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Deaths of Veterinarians

ROBERT L. ANDERES, KSC '34, 56; editor and publisher, VETERINARY MEDICINE, (see obituary p. 463) at Chicago, Ill., July 21, 1958.

JOHN E. BENDER, OSU '13, 79; member A.V.M.A.; with Bureau of Animal Industry, USDA, for 44 years; at Nashville, Tenn., recently.

C. F. BONTRAGER, OSU '07, 76; veterinary inspector for Swift and Company in Cleveland; at Fort Recovery, Ohio, May 6, 1958.

DONALD J. CAMPBELL, ONT '11; at Shawville, Que., Dec. 12, 1957.

ALBERT A. CLARK, at Marianna, Fla., April 1958.

E. J. CRAMER, AVC '92, 86, colonel, Veterinary Corps, U. S. Army (retired); at San Diego, Calif., March 22, 1958.

WILLIAM H. DEAN, UP '17, 67; colonel, Veterinary Corps, U. S. Army (retired); member A.V.M.A.; at Letterman Army Hospital, San Francisco, Calif., May 10, 1958.

WILLIAM C. EDWARDS, GR '06, 74; member A.V.M.A.; veterinarian for more than 50 years in Cambria, Wisc.; at Cambria, Wisc., after a brief illness.

JOSEPH H. EVANS, MCK '17, 66; member A.V.M.A.; at Genesee Depot, Wisc., May 5, 1958.

LEONARD R. HAUBRICH, SR., UP '11, 71; member A.V.M.A.; at Claremont, N. H., April 29, 1958.

R. R. HOUSE, at Kinsley, Kans. Feb. 24, 1958.

WILLIAM R. HULBUSH, WSC '38, 47; member A.V.M.A.; at Santa Maria, Calif., March 1958.

HAROLD E. JOHNSTON, ISC '13, 67, member A.V.M.A.; at Waterloo, Iowa April 24, 1958.

W. E. JONES, CIN '15, 68; member A.V.M.A. and Ohio V.M.A.; at Leesburg, Ohio, recently.

A. T. KNOWLES, KCV '04, 82; member A.V.M.A., the Florida V.M.A., a life member of the South Florida Veterinary Society, and the American Animal Hospital Association; with his sons, Robert and Jack, author of a number of articles in the literature; at Miami, Fla., April 22, 1958.

THOMAS A. McALLISTER, ONT '08, 82; at Kinde, Mich., recently.

VOLNEY C. McCRARY, 95, at Brevard, N. Car., May 4, 1958.

JOHN F. McDONOUGH, UP '10, 75; member A.V.M.A., Keystone and Pennsylvania V.M.A.; at Philadelphia, Penna., December 1957.

A. A. MILL, IND '14, 74; at Rushville, Ind., April 12, 1958.

L. E. MOSBACH, ISC '30, 50; member A.V.M.A.; at Humboldt, Iowa, April 1, 1958.

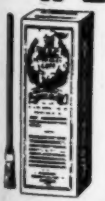
CARL OLSON, CVC '03; at Sac City, Iowa, April 1, 1958.

MERRIT PENNINGTON, 63, at Dale, Ind., April 16, 1958.

JOSEPH C. REID, KCV '07, 80; retired after service with the U.S. Civil Service Commission; at El Paso, Texas, April 9, 1958.

PERCIVAL B. SILVESTER, MCK '16, 71; at Princeton, N. J., April 21, 1958.

M·A·C



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1. Harris, J.R., and Clarkson, T.B., Prevention of Relapses in Milk Fever, Vet. Medicine, *12*:696 (Dec. 1955)

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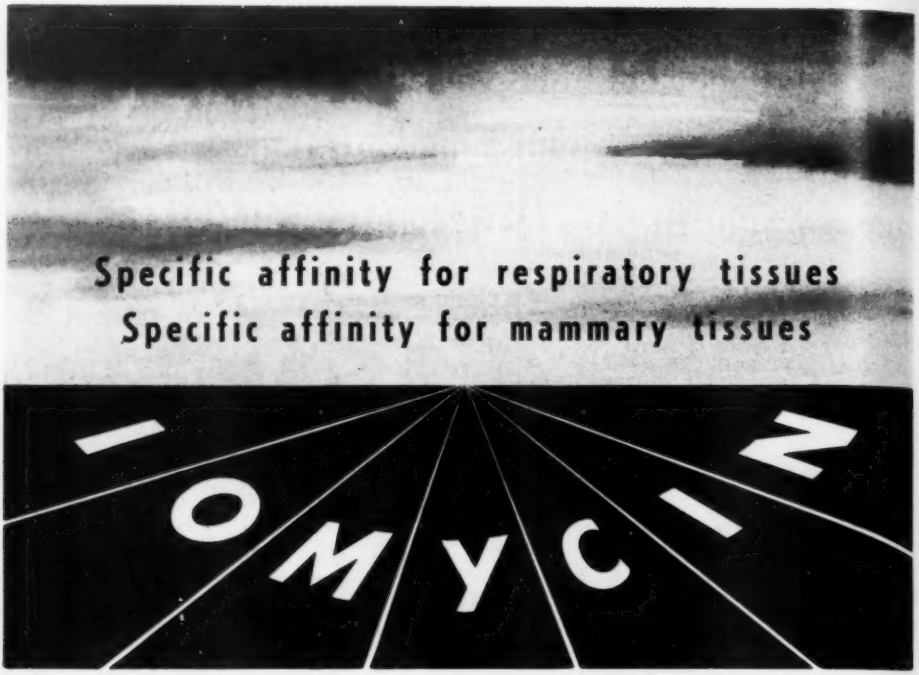

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